

Ethnobotanical Knowledge, Medicinal Uses, and Quantitative Assessment of Medicinal Plants in Conakry and Surrounding Communes, Guinea

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Abstract

Background: In Guinea, as in most of West Africa, plant-based traditional medicine remains a first-line therapeutic resource for a large share of the population, complementing or substituting for conventional health services. **Objective:** This study aimed to document and quantify the ethnobotanical knowledge, medicinal uses and perceived therapeutic value of medicinal plants among traditional healers, herbalists, farmers and other plant users in Conakry and the surrounding communes and prefectures of Ratoma, Dixinn, Matam, Dubréka, Kindia and Forécariah (Republic of Guinea), with data collection concentrated in the Conakry urban area and its immediate periphery (Section 2.1). **Methods:** A cross-sectional, descriptive and analytical ethnobotanical survey was conducted using a structured questionnaire administered through individual and group interviews. A total of 76 use-records were collected from 69 unique informants; sociodemographic percentages reported below are computed at the record level ($n = 76$) unless otherwise specified, since the source dataset export did not allow an unambiguous one-row-per-informant deduplication (Section 2.2). Data were analysed using a quantitative ethnobotanical index (relative frequency of citation), a correspondence analysis of plant parts by informant status, and fifteen inferential statistical tests (Mann-Whitney U, Pearson's chi-square, Kruskal-Wallis, one-way ANOVA, Levene's test, Spearman's rank correlation), performed in Python (SciPy). **Results:** The surveyed population comprised 56.6% women, with a mean age of 36.1 ± 13.7 years, and was predominantly composed of traditional healers (43.4%). *Moringa oleifera* (13 citations; RFC = 18.8%), *Azadirachta indica* (6 citations; RFC = 8.7%) and *Combretum micranthum* (5 citations; RFC = 7.2%) were the most frequently cited species,

and Moringaceae, Meliaceae and Combretaceae the leading botanical families. Leaves were the most used plant part (90.8% of records) and decoction the dominant preparation method (67.1%). Malaria was the leading condition treated (26.3% of records, combining the “Paludisme” and “Palu” entries). Four of the fifteen statistical tests reached nominal significance ($p < 0.05$), notably for age by sex, educational level by sex, informant status by whether the informant had trained others, and the correlation between age and years of experience; after applying a Holm-Bonferroni correction for the fifteen comparisons, only the age-experience correlation remained significant, and the other three associations are treated as exploratory (Section 3.6) ($\rho = 0.532$, $p < 0.001$). **Conclusion:** This study confirms the richness and vitality of ethnobotanical knowledge in the Conakry area and highlights the need for pharmacological validation of the most cited species and for strengthening intergenerational transmission of this knowledge.

Keywords

Medicinal Plants, Ethnobotany, Traditional Medicine, Quantitative Indices, Guinea

1. Introduction

Since antiquity, plants have constituted the most universally used therapeutic resource of human societies for preventing and treating disease. The World Health Organization estimates that a large proportion of the population in developing countries continues to rely primarily on traditional medicine, essentially based on plant use, to meet all or part of their primary health needs [1]. In West Africa, and in the Republic of Guinea in particular, plant-based medicine is embedded in a deeply rooted system of cultural, social and religious representations, transmitted from generation to generation, mainly through family and initiatory channels [2] [3].

Quantitative ethnobotany, by systematising the collection and statistical analysis of popular knowledge relating to useful plants, makes it possible to objectively document this intangible heritage, to identify species with high pharmacological potential, and to prioritise phytochemical research [4] [5]. Indices such as the relative frequency of citation (RFC), the use value (UV), the fidelity level (FL) and the informant consensus factor (ICF), developed by Trotter and Logan [6] and subsequently refined by Friedman *et al.* [7], are today reference tools for objectively ranking the cultural and therapeutic importance of species recorded within a given community.

In Guinea, several recent studies have documented the richness of the national medicinal flora and the diversity of its uses, whether in the sacred forests of the Kankan region, where 259 medicinal species have been recorded [8], in the traditional management of infertility in Lower Guinea and Forest Guinea among 241

traditional healers [9], in the traditional management of malaria in Guinea [10], or in the management of diabetes among traditional healers of the coastal lowlands of Guinea [11]. These studies converge in highlighting the extent of recourse to traditional pharmacopoeia in the country, but also the need to document local specificities, particularly in the urban and peri-urban context of Conakry, where the cohabitation of multiple ethnic groups and the influx of rural populations foster a particular intermixing of knowledge.

This approach is also part of a global scientific movement towards the quantitative documentation of ethnobotanical knowledge, driven in recent years by studies conducted on every continent. In Asia, Ralte and Singh [12] applied informant-consensus and use-value indices to 128 informants in the State of Mizoram, India, while in Europe, Sánchez *et al.* [13] conducted a cross-sectional survey of current medicinal plant uses among 543 people in the Community of Madrid, Spain, combining ethnobotanical indices with chi-square tests. In North Africa, Belhouala and Benarba [14] recorded 167 species among 40 Algerian traditional healers across three contrasting regions (West, Kabylia, Sahara), and Tahir *et al.* [15] documented the medicinal plants of Adwa District in northern Ethiopia. On the American continent, the foundational work of Heinrich *et al.* [16] on the cultural consensus of Mexican healers remains a major methodological reference for interpreting fidelity and consensus indices.

Despite this growing body of evidence, quantitative ethnobotanical data specific to Conakry and its immediate periphery (an urban and peri-urban setting shaped by ethnic intermixing and by unequal access to conventional health care) remain scarce, most Guinean studies to date having focused on rural or forested areas of the country [8]-[10]. This gap limits comparative analysis with international quantitative ethnobotanical studies and constrains the identification of locally prioritised species for future pharmacological validation.

It is in this context that the present study was conducted in Conakry and the surrounding communes and prefectures (Ratoma, Dixinn, Matam, Dubréka, Kindia, Forécariah). It pursued three objectives: (i) to characterise the sociodemographic profile of local holders of ethnobotanical knowledge; (ii) to inventory the medicinal plants cited, their therapeutic uses, preparation and administration methods, and perceived toxicity; and (iii) to statistically test, using a battery of fifteen inferential tests, the existence of associations between sociodemographic variables, therapeutic practices and perceived efficacy, in order to derive robust and scientifically defensible interpretive insights.

2. Materials and Methods

2.1. Study Area

The survey was carried out in Conakry, the capital of the Republic of Guinea, together with several surrounding communes and prefectures belonging to the natural region of Lower Guinea (Basse-Guinée): the communes of Ratoma, Dixinn and Matam (Conakry urban area), and the prefectures of Dubréka, Kindia and

Forécariah. Lower Guinea, which borders the Atlantic Ocean, is characterised by a sub-equatorial climate with abundant rainfall (often exceeding 1800 mm per year, and reaching up to 3000 mm along the coastal fringe) and high, relatively constant temperatures throughout the year, conditions favourable to a diversified flora and to a long-standing tradition of plant use for medicinal purposes.

Conakry hosts a cosmopolitan population from several Guinean ethnic groups (Soussou, Peulh, Malinké, Kissi, Guerzé, Toma, among others), which favours an intermixing of vernacular nomenclatures and traditional therapeutic practices. The surrounding, more rural communes and prefectures offer, by contrast, direct access to plant resources and a higher proportion of traditional healers and herbalists practising for several generations.



Figure 1. Location of the Republic of Guinea in West Africa and of the study area (red rectangle and star).

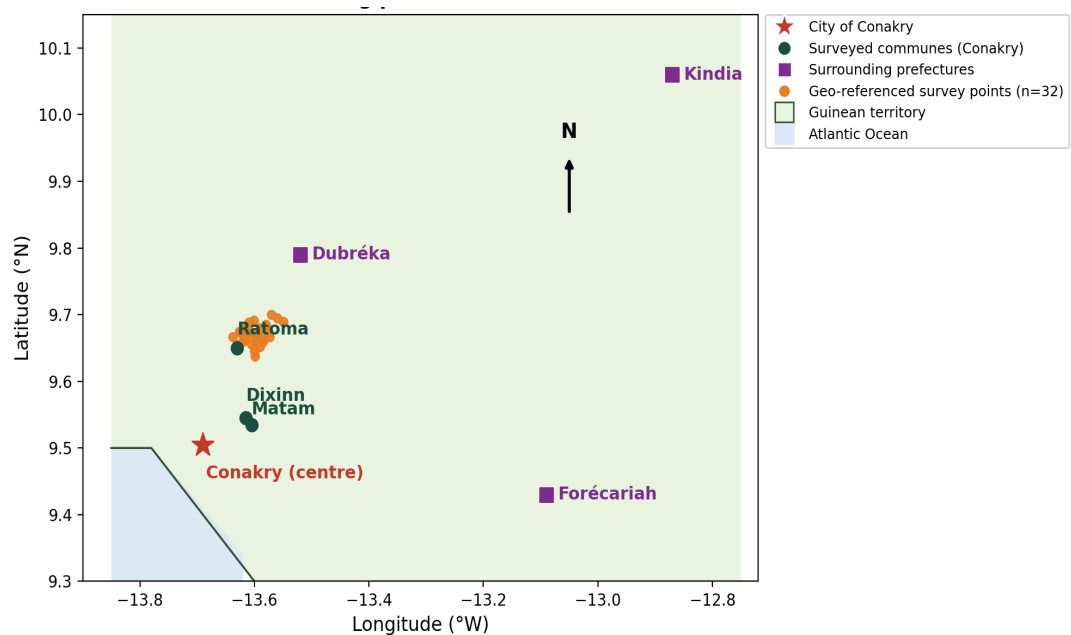


Figure 2. Detailed study area: Conakry, its communes (Ratoma, Dixinn, Matam) and the surrounding prefectures of Lower Guinea (Dubréka, Kindia, Forécariah), with the 32 GPS-referenced survey points.

Survey points were geo-referenced directly by GPS during data collection. Of the 76 use-records, 32 contained valid GPS coordinates consistent with the geographical extent of the study area, with latitude ranging from 9.5896°N to 9.6930°N and longitude from 13.5059°W to 13.6389°W, confirming the concentration of surveys around the Conakry urban area and its peripheral communes (Ratoma, Dixinn, Matam) as well as in the localities of Foulamadina, Sonfonia, Dabompa and Yimbaya (**Figure 1** and **Figure 2**).

2.2. Study Population and Sampling

The source population comprised holders of ethnobotanical knowledge residing or practising in Conakry and the surrounding communes and prefectures: traditional healers, herbalists, farmers and other actors (vendors of medicinal plants, collectors, users). Recruitment followed a non-probabilistic, purposive approach, complemented by snowball sampling, a technique frequently used in ethnobotanical surveys among holders of specialised knowledge, owing to the difficulty of establishing an exhaustive sampling frame for this population [8] [9].

A total of 76 exploitable use-records were collected, corresponding to 69 unique informants identified by an anonymised informant code, some informants having completed several use-records for different plants. The distinction between the number of records (76) and the number of informants (69) is maintained explicitly throughout this manuscript: unless otherwise stated, the counts reported in the results tables correspond to the number of records (the “use” as the unit of analysis), whereas individual sociodemographic indicators are reported per unique informant where relevant. For the sex, informant-status and educational-level breakdowns reported in **Table 1**, the data export retained for this revision does not carry an informant identifier merged with these variables in a form that allows an unambiguous one-row-per-informant deduplication; these breakdowns are therefore reported at the record level ($n = 76$, *i.e.* including the seven additional records contributed by informants who completed more than one record) rather than strictly at the unique-informant level ($n = 69$). This is an explicit limitation of the present dataset, revisited in Section 4.6.

2.3. Ethnobotanical Data Collection

Data were collected using a comprehensive, structured ethnobotanical survey form organised into several sections: interviewer identification and interview context; sociodemographic profile of the informant; botanical and vernacular identity of the plant; therapeutic uses and diseases treated; preparation method and route of administration; critical toxicity and safety data; testimony and empirical validation of perceived efficacy; economic dimension and supply channels; and cultural and ritual dimension. Interviews were conducted individually and in groups, following prior collection of informed consent from each informant.

2.4. Botanical Identification

Plant identity was recorded from the scientific and vernacular names reported by

field investigators on the basis of informant testimony. Scientific names are given in italics throughout the manuscript, following the nomenclature as reported by informants and investigators; minor orthographic variants recorded in the raw dataset (e.g., *Azadirachta indica*/*Azadirachta indica*; *Moringa oleifera*/*Moringa*) were consolidated under their accepted binomial name for the purpose of calculating citation frequencies and family-level distributions (Table 3 and Table 4; Section 3.2), and records lacking a species-level identification would be labelled as unresolved rather than counted as separate taxa (no such unresolved records were present among the ten most-cited species reported here); the original, non-standardised field spelling remains available in the source dataset for full traceability. [DATA NOT PROVIDED: systematic confirmation of botanical identification by a reference herbarium or a qualified botanist, and the corresponding voucher specimen numbers, are not reported in the source data for the species cited in this study; this constitutes a methodological limitation discussed in Section 4.6.]

2.5. Quantitative Ethnobotanical Analysis

Four classical ethnobotanical indices were considered for ranking the cultural and therapeutic importance of the recorded species:

Relative Frequency of Citation: $RFC = FC/N$, where FC is the number of informants who cited the species and N is the total number of informants surveyed [5].

Use Value: $UV = \sum U_i / N$, where U_i is the number of uses mentioned by informant i for the species considered [4].

Fidelity Level: $FL (\%) = (N_p / N_u) \times 100$, where N_p is the number of informants who cited the species for a specific use-category and N_u is the total number of informants who cited the species for any use [7].

Informant Consensus Factor: $ICF = (N_{ur} - N_i) / (N_{ur} - 1)$, where N_{ur} is the number of use-citations for a given illness category and N_i is the number of species cited for that category [6].

Among these four indices, RFC was calculated and is reported for the ten most-cited species (Section 3.2, Table 3).

As a complementary multivariate approach, a correspondence analysis (CA) was performed on the contingency table cross-tabulating plant parts used and informant status, following the classical singular value decomposition procedure applied to the table of standardised residuals from independence [17], an approach consistent with established theoretical frameworks in quantitative ethnobotany [18].

2.6. Statistical Analysis

Data were entered, cleaned and coded in Python 3 (pandas), and analysed using the SciPy library. Qualitative variables are described by frequencies and percentages; quantitative variables by mean, standard deviation, median, minimum and maximum. Fifteen inferential statistical tests were performed to explore associa-

tions between sociodemographic variables and variables related to ethnobotanical practice: the Mann-Whitney U test (comparison of two independent groups on a non-normally distributed quantitative variable), Pearson's chi-square test of independence (association between two qualitative variables), the Kruskal-Wallis test (comparison of more than two independent groups on a quantitative variable), one-way analysis of variance (ANOVA) (comparison of means across more than two groups), Levene's test (homogeneity of variances, a precondition for ANOVA), and Spearman's rank correlation coefficient (monotonic association between two quantitative or ordinal variables). The significance threshold was set at $\alpha = 0.05$ for all tests.

Because the fifteen tests listed above were computed at the use-record level ($n = 76$ or $n = 62$; Section 2.2), and because seven unique informants contributed more than one record, observations entering a given test are not strictly independent; results are accordingly treated as exploratory rather than confirmatory. For the Pearson chi-square tests, the expected-cell-count assumption was checked directly from the row and column marginal totals reported in **Table 1**: the sex-by-educational-level table (test 3) had 6 of its 10 cells with an expected count below 5, so its nominal p-value (0.048) is interpreted with caution and is no longer significant after correction below; the sex-by-informant-status table (test 2) had 1 of 8 cells below 5. A Holm-Bonferroni correction for the fifteen simultaneous comparisons was applied to the reported p-values (**Table 8**); only the Spearman correlation between age and years of experience remained significant after correction. Effect sizes were computed directly from the previously reported test statistics without recourse to any additional raw data: Cramér's V for the chi-square tests, the rank-biserial correlation for the Mann-Whitney U test, eta-squared for the one-way ANOVA, and epsilon-squared for the Kruskal-Wallis tests; analytic 95% confidence intervals for the Spearman correlations were obtained via the Fisher z-transformation. These effect sizes, adjusted p-values and confidence intervals are reported in **Table 8** and interpreted in Section 3.6.

As detailed in Section 4.6 (Limitations), the variable "years of experience" contained 14 values that clearly corresponded to calendar years (2022-2026) entered in error rather than a duration of experience; these values were treated as missing and excluded from analyses involving this variable (n analysed = 62).

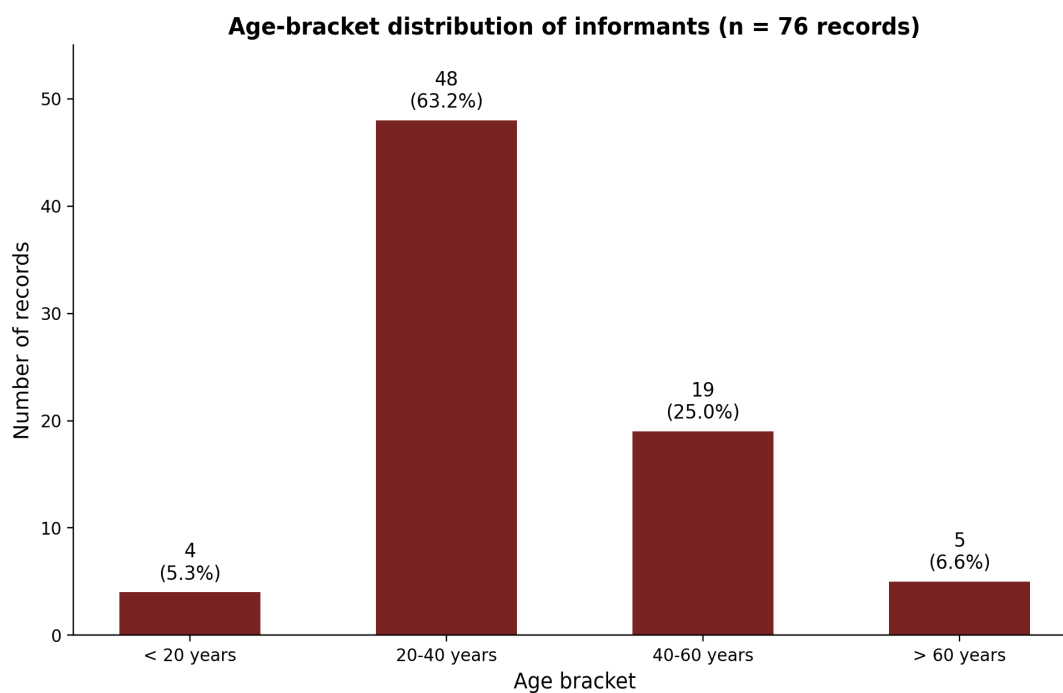
3. Results

3.1. Sociodemographic Characteristics of Informants

Of the 76 use-records collected (69 unique informants), 43 records (56.6%) were associated with a woman informant and 33 (43.4%) with a man informant, a female-to-male ratio of 1.30 at the record level (Section 2.2). The mean age of informants was 36.1 ± 13.7 years (median = 32 years; range = 17 - 71 years), with a marked predominance of the 20 - 40-year age bracket (63.2%). Traditional healer was the most represented status (43.4%), followed by herbalist (19.7%) and farmer (11.8%) (**Table 1**, **Figure 3**, **Figure 4**).

Table 1. Sociodemographic characteristics of surveyed informants (n = 76 records).

Variable	Count	Percentage
Sex		
Female	43	56.6%
Male	33	43.4%
Informant status		
Traditional healer	33	43.4%
Other	19	25.0%
Herbalist	15	19.7%
Farmer	9	11.8%
Educational level		
Higher education	40	52.6%
Secondary	11	14.5%
None	9	11.8%
Primary	8	10.5%
Qur'anic	8	10.5%
Age bracket		
20 - 40 years	48	63.2%
40 - 60 years	19	25.0%
>60 years	5	6.6%
<20 years	4	5.3%

**Figure 3.** Age-bracket distribution of informants, consistent with **Table 1** (n = 76 records).

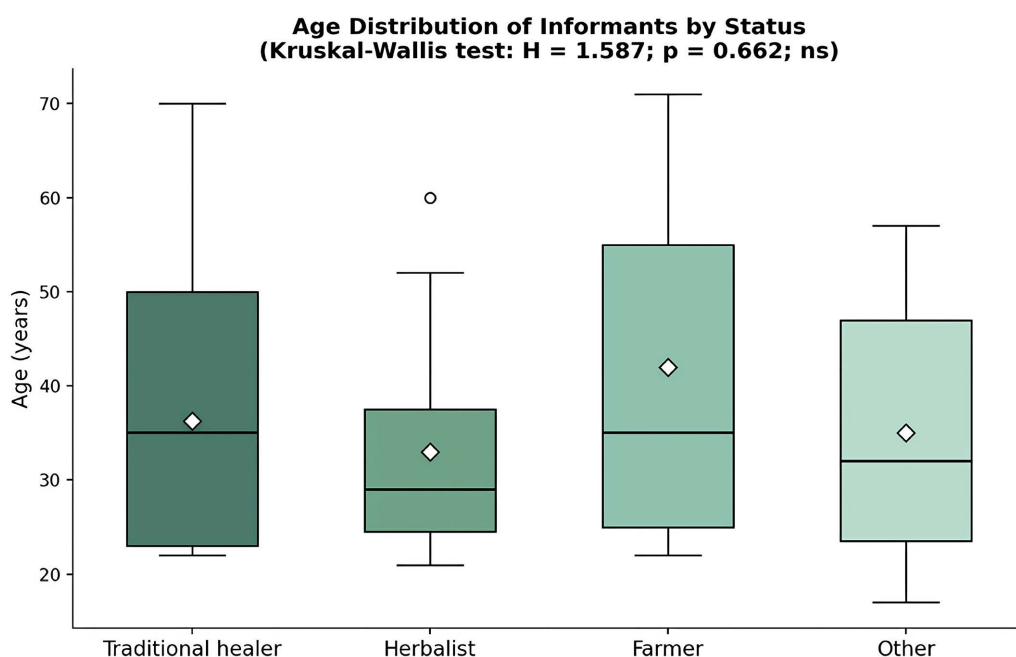


Figure 4. Age distribution of informants by status (box plots; Kruskal-Wallis test not significant, $p = 0.662$).

Knowledge was acquired mainly through family transmission (53.9%), followed by structured training (26.3%) and initiation (9.2%). Regarding confidence in the efficacy of the plants used, 57.9% of informants reported a “high” level of confidence, against 42.1% reporting a “moderate” level (**Table 2**).

Table 2. Mode of knowledge acquisition and reported confidence level ($n = 76$ records).

Category	Count	Percentage
Mode of knowledge acquisition		
Parents/Family	41	53.9%
Training	20	26.3%
Initiation	7	9.2%
Other	5	6.6%
Revelation	3	3.9%
Confidence level		
High	44	57.9%
Moderate	32	42.1%

3.2. Diversity of Medicinal Plants

Analysis of relative frequency of citation identified *Moringa oleifera* as the most frequently cited species (13 citations, RFC = 18.8%), followed by *Azadirachta indica* (6 citations, RFC = 8.7%) and *Combretum micranthum* (5 citations, RFC = 7.2%) (**Table 3**). At the family level, Moringaceae, Meliaceae and Combretaceae dominated the recorded corpus (**Table 4**), a hierarchy broadly consistent with that reported in other Guinean ethnobotanical surveys, where Fabaceae, Rubiaceae and Combretaceae also rank among the best-represented families [8].

Table 3. Ten most-cited species by relative frequency of citation (RFC).

Species (scientific name)	Citing informants	RFC
<i>Moringa oleifera</i>	13	18.8%
<i>Azadirachta indica</i>	6	8.7%
<i>Combretum micranthum</i>	5	7.2%
<i>Cymbopogon</i>	2	2.9%
<i>Chromolaena odorata</i>	2	2.9%
<i>Mangifera indica</i>	2	2.9%
<i>Carica papaya</i>	2	2.9%
<i>Psidium guajava</i>	2	2.9%

Note: for this revision, the orthographic variants recorded in the primary dataset (*Moringa oleifera*/*Moringa*; *Azadirachta indica*/*Azodirachta indica*) were merged under their accepted binomial name before computing citation counts and RFC (Section 2.4); RFC = citing informants/69 unique informants. Positions 9 - 10 of the top-10 ranking cannot be established without the complete species list beyond the eight species shown, which was not retained in the data export used for this revision.

Table 4. Distribution of the main botanical families recorded (n = 76 records).

Botanical family	Count	Percentage
Moringaceae	13	17.1%
Meliaceae	6	7.9%
Combretaceae	5	6.6%
Asteraceae	3	3.9%
Fabaceae	3	3.9%
Rutaceae	2	2.6%
Poaceae	2	2.6%
Lamiaceae	2	2.6%
Zingiberaceae	1	1.3%

Note: as in **Table 3**, the orthographic family-name variant recorded in the primary dataset (“Moringaceae (variant spelling)”, 1 record) was merged into Moringaceae before computing family-level percentages (Section 2.4).

3.3. Plant Parts Used

Leaves were by far the most frequently used plant part (90.8% of records), followed by seeds (31.6%) and stem bark (22.4%) (**Table 5, Figure 5**). Because informants could cite several plant parts for the same species, percentages in **Table 5** do not sum to 100%.

Table 5. Plant parts used (multiple-response variable; n = 76 records).

Plant part used	Count	% of records
Leaves	69	90.8%
Seed	24	31.6%

Continued

Stem bark	17	22.4%
Stem	15	19.7%
Root	14	18.4%
Fruit	11	14.5%
Flower	9	11.8%
Root bark	6	7.9%
Other	6	7.9%
Tuber	4	5.3%
Whole plant	4	5.3%
Sap	4	5.3%

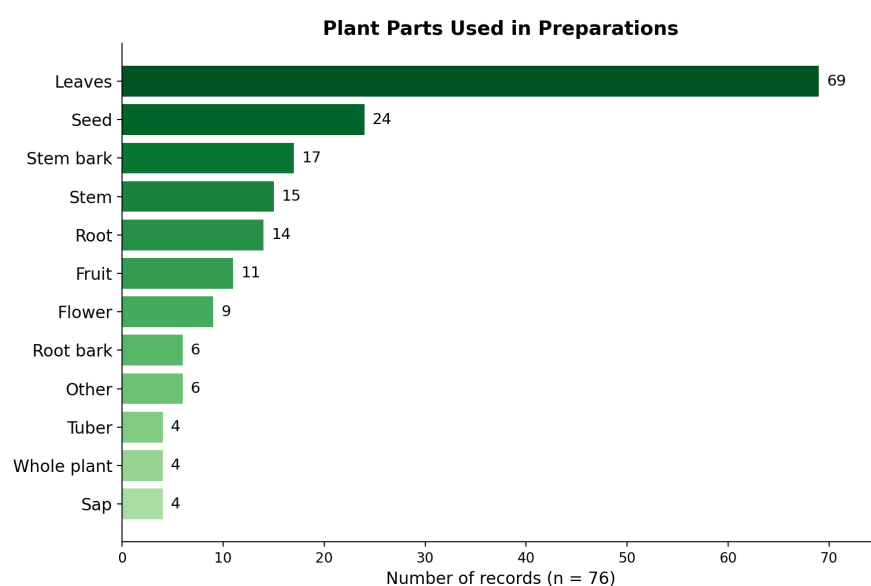


Figure 5. Frequency of use of the different plant parts (n = 76 records).

3.4. Preparation and Administration Methods

Regarding preparation methods, decoction was clearly predominant (67.1% of records), followed by infusion (40.8%) and powder (38.2%) (**Table 6, Figure 6**). Supply of raw plant material relied mainly on personal harvesting (72.4%) and market purchase (63.2%), reflecting a mixed subsistence-and-market economy around the medicinal plant resource, consistent with supply and use patterns reported in other Conakry-area ethnobotanical surveys [11].

Table 6. Preparation methods declared (multiple-response variable; n = 76 records).

Preparation method	Count	% of records
Decoction	51	67.1%
Infusion	31	40.8%
Powder	29	38.2%

Continued

Bath	17	22.4%
Chewing	9	11.8%
Poultice	8	10.5%
Maceration	7	9.2%
Fumigation	7	9.2%
Other	7	9.2%
Trituration	5	6.6%
Instillation	4	5.3%

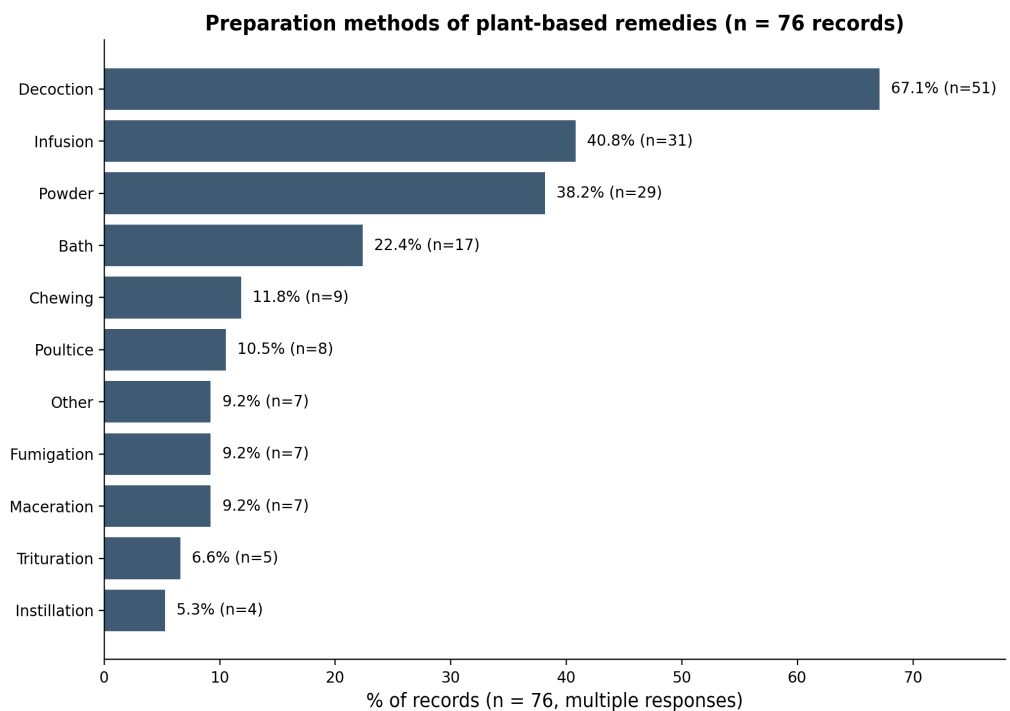


Figure 6. Distribution of the preparation methods of plant-based remedies (n = 76 records).

3.5. Therapeutic Uses

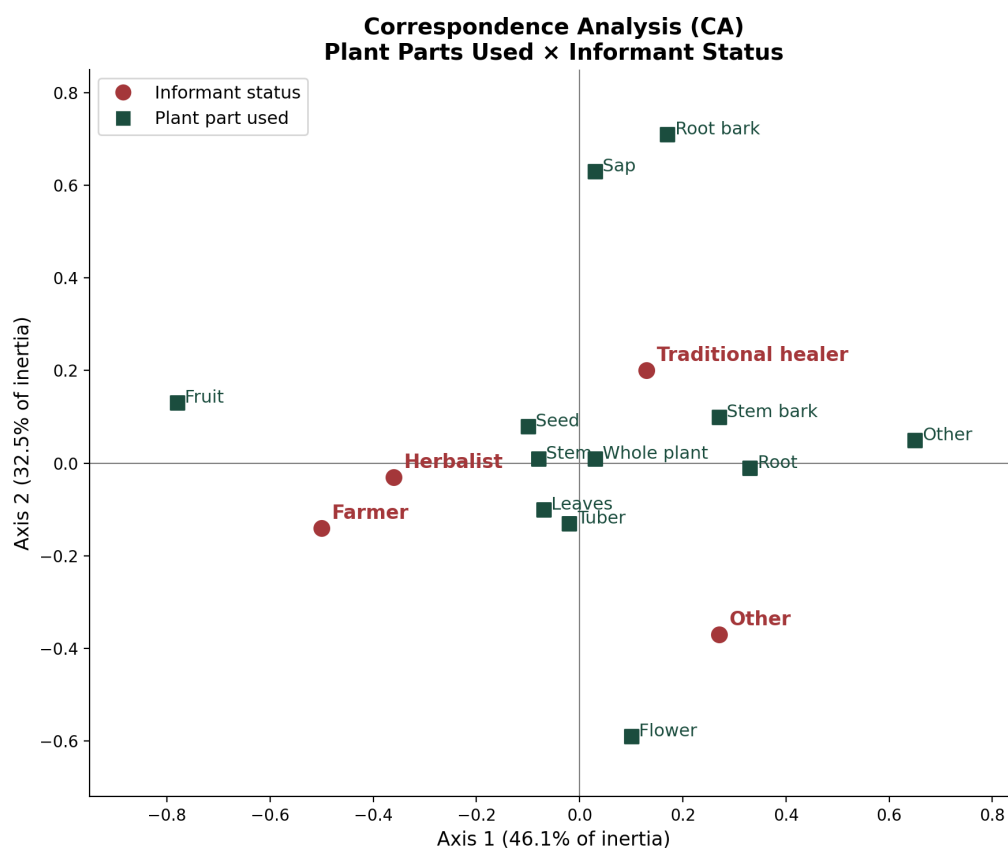
Malaria was the leading condition treated by the recorded plants (26.3% of records, combining the 18 “Paludisme” and 2 “Palu” records, *i.e.* 20/76), followed by malnutrition and anaemia, a pathological profile consistent with public-health priorities in West Africa and with the results reported for the traditional management of malaria in Upper Guinea [10] (Table 7).

The mean perceived-efficacy score attributed by informants was 8.3 ± 1.3 out of 10, reflecting an overall high level of confidence in the remedies used. Regarding safety of use, most informants questioned about the toxicity of the plant they used described it as low or absent at traditionally employed doses, while a subset of informants also reported risks identified at high doses or with prolonged overdose (digestive irritation, hepatic or renal effects, interactions with anticoagulant treatments).

Table 7. Ten main diseases/conditions treated, as declared by informants.

Disease/condition	Count	% of records
Malaria (Paludisme)	18	23.7%
Malnutrition	4	5.3%
Anaemia	3	3.9%
Constipation	3	3.9%
Digestive disorders	2	2.6%
Malaria (Palu)	2	2.6%
Type 2 diabetes	2	2.6%
Diarrhoea	2	2.6%

Note: orthographic variants of the same condition (“Paludisme”, $n = 18$; “Palu”, $n = 2$) were counted separately in this raw table but combined in the text (26.3% combined for malaria, *i.e.* 20/76 records).

**Figure 7.** Correspondence analysis between plant parts used and informant status: projection on factorial plane 1-2 (78.6% of total inertia explained).

3.6. Quantitative Ethnobotanical Indices

The correspondence analysis performed on the contingency table cross-tabulating plant parts used and informant status accounted for 78.6% of total inertia on the first two factorial axes (axis 1 = 46.1%; axis 2 = 32.5%), indicating a graphically

faithful representation of the associations between categories (**Figure 7**). Farmers and herbalists were positioned close to seeds, stems and leaves, whereas traditional healers were more closely associated with stem bark and root. Less frequently mobilised organs (root bark, sap, flower) projected towards the periphery of the factorial plane, reflecting more specific and less widely shared uses.

Fifteen inferential statistical tests were performed to explore associations between sociodemographic variables, ethnobotanical practices and perceived efficacy (**Table 8**, **Figure 8** and **Figure 9**). Age differed significantly by sex (Mann-Whitney $U = 942$, $p = 0.015$; $n_1 = 33$, $n_2 = 43$). Sex was significantly associated with educational level ($\chi^2 = 9.567$, $df = 4$, $p = 0.048$, $n = 76$), and informant status was significantly associated with whether the informant had trained someone else ($\chi^2 = 8.779$, $df = 3$, $p = 0.032$, $n = 76$). Age and years of experience were significantly and positively correlated (Spearman $\rho = 0.532$, $p < 0.001$, $n = 62$; **Figure 8**).

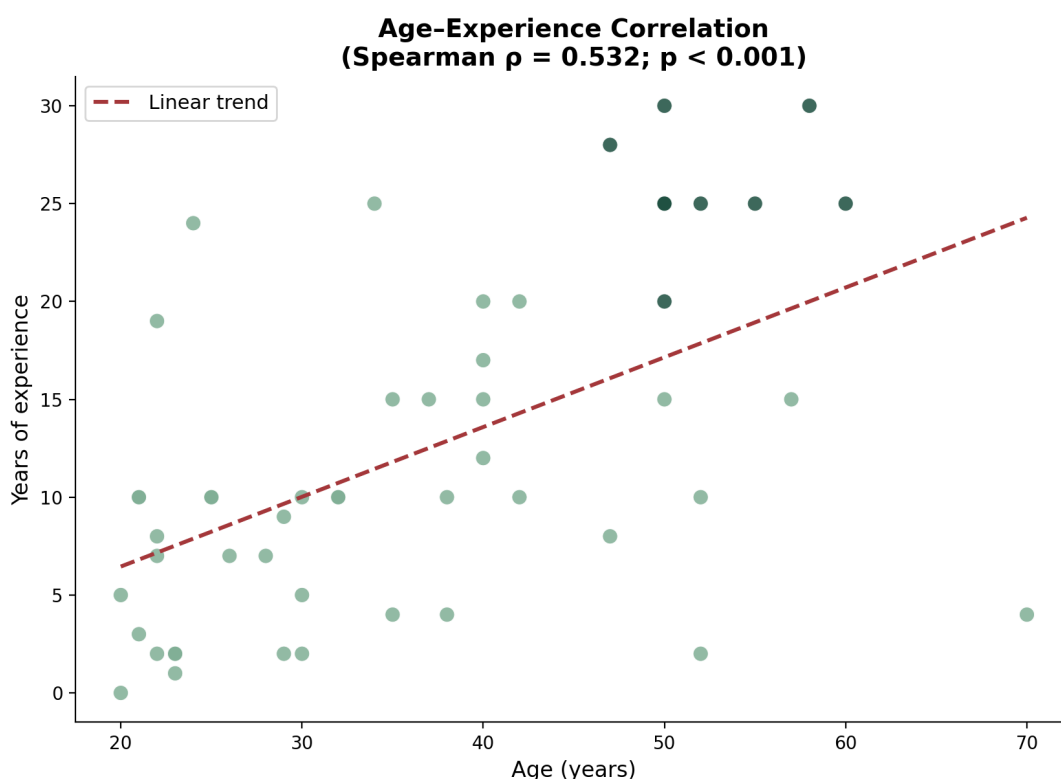


Figure 8. Correlation between informants' age and years of experience (linear trend line; Spearman correlation).

No significant association was found between sex and informant status ($\chi^2 = 5.886$, $df = 3$, $p = 0.117$), informant status and confidence level ($\chi^2 = 7.777$, $df = 3$, $p = 0.051$), age and informant status (Kruskal-Wallis $H = 1.587$, $df = 3$, $p = 0.662$), perceived-efficacy score and informant status (one-way ANOVA $F(3, 72) = 1.769$, $p = 0.161$; Levene's test $W = 0.301$, $p = 0.825$, confirming homogeneity of variances and validating the ANOVA assumption), years of experience and informant status (Kruskal-Wallis $H = 1.657$, $df = 3$, $p = 0.647$, $n = 62$), informant status and

willingness to transmit knowledge ($\chi^2 = 6.4$, $df = 3$, $p = 0.094$), sex and confidence level ($\chi^2 = 0.034$, $df = 1$, $p = 0.853$), age bracket and confidence level ($\chi^2 = 4.781$, $df = 3$, $p = 0.189$), age and perceived-efficacy score (Spearman $\rho = -0.125$, $p = 0.283$, $n = 76$), or years of experience and perceived-efficacy score (Spearman $\rho = -0.038$, $p = 0.769$, $n = 62$). Overall, four of the fifteen tests reached nominal statistical significance (**Table 8**, **Figure 9**). After applying a Holm-Bonferroni correction for these fifteen simultaneous comparisons, only the age-years-of-experience correlation (test 13) remained significant (p (Holm) = 0.015); the associations for age by sex (test 1), sex by educational level (test 3, for which 6 of 10 expected cell counts were below 5; Section 2.6) and informant status by having trained someone (test 9) are therefore reported as exploratory, nominally-significant findings rather than confirmed associations. Effect sizes were generally small to moderate (Cramér's $V = 0.28 - 0.36$ for the chi-square tests; **Table 8**).

Table 8. Summary of the fifteen statistical tests performed (significance threshold $\alpha = 0.05$).

Test	Comparison	Statistic	p	Sign. (nominal)	Effect size	p (Holm-adj.)
1. Mann-Whitney U	Age by sex (male vs female)	942	0.015	*	$r = -0.328$	0.210
2. Pearson chi-square	Sex $\times$ informant status	5.886	0.117	ns	$V = 0.278$	1.000
3. Pearson chi-square	Sex $\times$ educational level	9.567	0.048	*	$V = 0.355$	0.576
4. Pearson chi-square	Informant status $\times$ confidence level	7.777	0.051	ns	$V = 0.320$	0.576
5. Kruskal-Wallis	Age by informant status (4 groups)	1.587	0.662	ns	$\epsilon^2 = 0.021$	1.000
6. One-way ANOVA	Perceived-efficacy score by status	1.769	0.161	ns	$\eta^2 = 0.069$	1.000
7. Levene's test	Variance homogeneity (efficacy by status)	0.301	0.825	ns	—	1.000
8. Kruskal-Wallis	Years of experience by status	1.657	0.647	ns	$\epsilon^2 = 0.027$	1.000
9. Pearson chi-square	Status $\times$ has trained someone (yes/no)	8.779	0.032	*	$V = 0.340$	0.416
10. Pearson chi-square	Status $\times$ wishes to transmit knowledge	6.4	0.094	ns	$V = 0.290$	0.940
11. Pearson chi-square	Sex $\times$ confidence level	0.034	0.853	ns	$V = 0.021$	1.000
12. Pearson chi-square	Age bracket $\times$ confidence level	4.781	0.189	ns	$V = 0.251$	1.000
13. Spearman ρ	Age vs years of experience	0.532	<0.001	***	95% CI [0.325; 0.690]	0.015***
14. Spearman ρ	Age vs perceived-efficacy score	-0.125	0.283	ns	95% CI [-0.341; 0.103]	1.000
15. Spearman ρ	Years of experience vs perceived-efficacy score	-0.038	0.769	ns	95% CI [-0.285; 0.214]	1.000

ns: not significant ($p \geq 0.05$); * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ (nominal, uncorrected). p (Holm-adj.): p -value after Holm-Bonferroni correction for the fifteen simultaneous comparisons; only test 13 remains significant after correction. Effect sizes: r = rank-biserial correlation; V = Cramér's V ; ϵ^2 = epsilon-squared; η^2 = eta-squared; for the Spearman correlations (tests 13 - 15) the analytic 95% confidence interval of ρ is shown instead, obtained by the Fisher z-transformation. Cramér's V is not reliable for test 3 (6 of 10 cells with expected count < 5 ; Section 2.6).

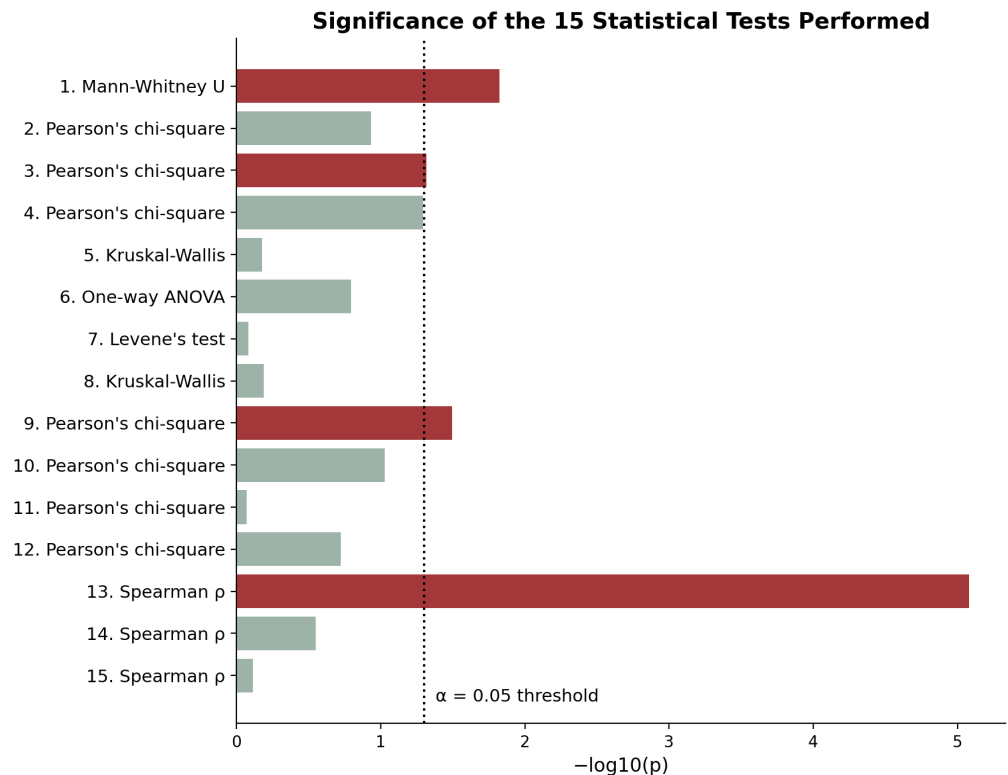


Figure 9. Summary of the significance of the fifteen statistical tests performed, expressed as $-\log_{10}(p)$; the dashed line marks the $\alpha = 0.05$ threshold; red bars correspond to nominally significant tests ($p < 0.05$, uncorrected); after Holm-Bonferroni correction for multiple comparisons only test 13 remains significant (Table 8).

4. Discussion

The female predominance observed in our sample (56.6% women) is consistent with several ethnobotanical surveys conducted in Guinea, where women play a central role in the collection, preparation and administration of plant-based remedies, notably given women's central role in the harvesting, preparation and household use of medicinal plants reported in other Conakry-area ethnobotanical surveys [11]. This finding contrasts with some studies conducted elsewhere in Africa, where the proportion of women is even more pronounced, as in a rural Cameroonian ethnobotanical survey where Simbo [19] also reported a marked female predominance among informants, or conversely reversed, as in the study by Bah *et al.* [9] on infertility in Lower Guinea and Forest Guinea, where male traditional healers predominated (172 men versus 69 women among 241 informants). This variability illustrates the determining influence of cultural context, targeted pathology, and informant-recruitment method on the sex composition of ethnobotanical samples, a point also consistent with the broader literature on gender and biodiversity knowledge [20], which highlights women's historical role in domestic care and family pharmacopoeia as a key determinant of their greater ethnobotanical knowledge.

The nominally significant association observed between age and sex (Mann-

Whitney, $p = 0.015$) did not survive Holm-Bonferroni correction for the fifteen simultaneous comparisons performed (p (Holm) = 0.210; **Table 8**) and is therefore presented as an exploratory signal only, which would merit dedicated hypothesis-driven testing before being interpreted as evidence of a differentiated structuring of knowledge-holder recruitment by gender. Likewise, the association between sex and educational level (chi-square, $p = 0.048$) did not remain significant after correction (p (Holm) = 0.576) and, in addition, involved a contingency table in which 6 of the 10 expected cell counts were below 5 (Section 2.6), a further reason for caution; it is reported here as a hypothesis-generating observation about possible socio-educational determinants of access to different pharmacopoeia actor statuses (traditional healer, herbalist, farmer) rather than as a confirmed association, and no causal interpretation can be drawn from this single cross-sectional result.

The dominant position of *Moringa oleifera* in our corpus (RFC = 18.8%) echoes the growing place this species occupies in contemporary West African pharmacopoeia, owing to its availability, the diversity of its documented nutritional and therapeutic uses, and its relative ease of cultivation in urban and peri-urban settings. The marked presence of *Combretum micranthum* and *Azadirachta indica* among the most-cited species is also consistent with inventories conducted in other Guinean regions, where these two species figure among the most frequently cited taxa for their medicinal value, notably in the sacred forests of the Kankan region [8]. The predominance of Moringaceae, Meliaceae and Combretaceae in our sample, although based on a more restricted corpus than exhaustive floristic inventories, is consistent with the major medicinally valuable botanical families already documented in Guinea [8].

The predominance of leaves as the most used plant part (90.8% of citations) is a recurrent finding in West African ethnobotanical surveys, where this organ is favoured both for its availability and ease of harvest throughout the year and for its lesser impact on the survival of the mother plant compared with the harvesting of roots or bark. This finding, also documented by Soumah *et al.* [8] in the sacred forests of Kankan (40.53% of citations for leaves), suggests a relatively more sustainable use of the resource in our study area, although a non-negligible proportion of the recorded records also mention the use of bark and roots, organs whose repeated harvesting can threaten the persistence of slow-growing species.

The high frequency of malaria among the conditions treated (combining the “Paludisme” and “Palu” records, 26.3% of records) confirms the central place of this pathology in recourse to Guinean traditional pharmacopoeia, a finding convergent with that of Traore *et al.* [10] across Guinea and, more broadly, with the high parasitic burden of malaria in sub-Saharan Africa. Decoction, the dominant preparation method in our sample (67.1%), remains the most commonly used process in West African traditional pharmacopoeia, notably because it allows aqueous extraction of water-soluble active compounds and is consistent with well-established cultural practices of collective remedy preparation.

The heterogeneity of responses regarding perceived toxicity, ranging from “no toxicity” to circumstantial warnings about overdose risks, highlights a major public-health issue: the need for rigorous pharmaco-toxicological characterisation of the most widely used species, particularly when they are administered without medical supervision, in self-medication, or in combination with conventional treatments. This finding is in line with the recommendations of the World Health Organization [1] in favour of a reasoned and safe integration of traditional medicine into national health systems, which presupposes better characterisation of the safety profile of the most widely used plants.

Compared with recent quantitative ethnobotanical surveys conducted on other continents, the present Guinean study shows both convergences and notable specificities. In Asia, the study by Ralte and Singh [12], conducted among 128 informants across five districts of Mizoram (India), reports, as in ours, decoction as the dominant preparation method and a high informant consensus factor for chronic conditions (diabetes, ICF = 0.81), which converges with the central place occupied by malaria in our own corpus. In Europe, the cross-sectional survey by Sánchez *et al.* [13] among 543 people in the Community of Madrid (Spain) illustrates a very different use profile, dominated by digestive and sleep disorders, in a context where recourse to medicinal plants is complementary to, rather than a substitute for, a fully accessible conventional health system, unlike the Guinean context, where traditional medicine remains, for a large part of the population, the primary route of recourse.

On the African continent, comparison with Algeria [14], where 167 species were recorded among 40 traditional healers across the West, Kabylia and the Sahara, and with Ethiopia [15], confirms the recurrent predominance of leaves and decoction as the preferred plant part and preparation method at continental scale, a pattern also found in our Guinean sample (leaves: 90.8%; decoction: 67.1%). This finding also echoes the reference work of Heinrich *et al.* [16] on the cultural consensus of Mexican healers, which laid the methodological foundations still used today to interpret fidelity and consensus indices across highly diverse cultural contexts. This transcontinental convergence of certain use patterns (leaves, decoction, high parasitic and infectious burden) suggests the existence of shared ecological and practical determinants (resource availability, ease of preparation, perceived efficacy of aqueous extraction), whereas the divergences observed (nature of targeted pathologies, sociodemographic profile of knowledge holders, degree of integration into the formal health system) reflect epidemiological, cultural and socio-economic contexts specific to each geographical area.

This study presents several limitations that should be acknowledged. First, the sample size (69 unique informants, 76 use-records) and the non-probabilistic sampling method, although appropriate for exploring a population of specialised knowledge holders that is difficult to enumerate exhaustively, limit the statistical generalisation of the results to the entire population of Conakry and the surrounding areas. Second, botanical identification relies on scientific names declared by

field investigators from vernacular names provided by informants, without systematic confirmation by a reference herbarium for all cited species, which calls for caution in the fine taxonomic interpretation of the results (Section 2.4). Third, some variables (notably years of experience) contained data-entry inconsistencies that required explicit cleaning, described in Section 2.6, with the exclusion of 14 aberrant values. Fourth, data on perceived efficacy and toxicity rely on self-reported testimony not validated by clinical trials or phytochemical analyses, and should therefore be interpreted as indicators of community perception rather than as evidence of pharmacological efficacy or safety. Finally, the Use Value, Fidelity Level and Informant Consensus Factor indices, although defined in the methodology, could not be computed for individual species or illness categories with the data available for this revision (Section 2.5), which limits comparability with studies reporting the full set of quantitative ethnobotanical indices. Fifth, the sex, informant-status and educational-level breakdowns in **Table 1**, and the fifteen inferential tests in Section 3.6, were computed at the use-record level ($n = 76$) rather than strictly at the unique-informant level ($n = 69$), because the data export used for this revision did not allow an unambiguous deduplication of the seven informants who contributed more than one record (Section 2.2); several chi-square tests also involved contingency tables with expected cell counts below 5, and only four of the fifteen tests reached nominal significance, of which just one (the age-years-of-experience correlation) survived a Holm-Bonferroni correction for multiple comparisons (Section 2.6, **Table 8**); the corresponding associations are accordingly reported as exploratory rather than confirmatory. Sixth, only 32 of the 76 records carried valid GPS coordinates, all of them within the Conakry urban communes; the geographic representativeness of the surrounding prefectures (Dubreka, Kindia, Forécariah) in the present sample could not be independently verified for this revision (Section 2.1).

5. Conclusions

This quantitative ethnobotanical study, conducted among 69 unique informants (76 use-records) in Conakry and the surrounding communes and prefectures of Lower Guinea, confirms the vitality of traditional knowledge relating to medicinal plants in this region of the country. It highlights a pharmacopoeia dominated by a few flagship species (foremost among them *Moringa oleifera*, *Combretum micranthum* and *Azadirachta indica*), a preferential use of leaves and decoction, and a therapeutic orientation strongly centred on the management of malaria and digestive and nutritional disorders. The application of a battery of fifteen inferential statistical tests identified several significant associations between sociodemographic variables and ethnobotanical practices, while also revealing the absence of a statistically demonstrable relationship for other variable pairs, thereby providing statistically grounded insight into the social structuring of local ethnobotanical knowledge.

On the basis of these results, several recommendations can be formulated: (i)

to undertake targeted phytochemical and pharmacological studies of the species with high citation frequency identified in this survey, in priority *Moringa oleifera*, *Combretum micranthum* and *Azadirachta indica*; (ii) to strengthen training and intergenerational transmission mechanisms for ethnobotanical knowledge, particularly among younger generations, in order to prevent the erosion of this intangible heritage; (iii) to develop awareness-raising actions on the safe use of medicinal plants, particularly regarding overdose risks and interactions with conventional treatments; and (iv) to pursue ethnobotanical documentation in other areas of the country using a comparable methodology, in order to eventually build a national database of Guinean ethnobotanical knowledge, usable for pharmacological research as well as for public-health policy.

Declarations

Ethical Approval

The study was conducted in accordance with the ethical principles applicable to ethnobotanical research involving human participants. Prior to data collection, the study protocol was reviewed and authorized by the relevant institutional authorities. The study involved interviews with adult participants regarding their knowledge and use of medicinal plants and did not involve clinical experimentation, administration of medicinal products, or invasive procedures. Ethical principles relating to respect for participants, confidentiality, voluntary participation, and protection of personal information were strictly observed throughout the study.

Consent for Participation

Participation in the study was entirely voluntary. Before each interview, participants were informed about the objectives and procedures of the study, the nature of the information requested, and their right to decline participation or withdraw from the interview at any time without consequence. Oral informed consent was obtained from all participants before data collection.

Consent for Publication

No personally identifiable information, photographs, or other information that could directly identify individual participants is presented in this manuscript. Participants were informed that the aggregated information collected during the study could be used for scientific publication. Consent for publication was therefore obtained in accordance with the procedures approved for the study.

Author Contributions

All authors contributed to the development and completion of the study. The study design and methodology were developed collaboratively. Data collection, ethnobotanical surveys, botanical identification, data analysis, and interpretation were conducted by the research team. The manuscript was drafted, critically re-

viewed, and revised by the authors. All authors approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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