**Journal of Applied Biosciences 222: 24665 – 24682**
**ISSN 1997-5902**

# Medicinal plants used in the management of infertility and erectile dysfunction: a quantitative ethnobotanical survey in the Zinder Region, Niger.

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Submitted 05/05/2026, Published online on 31/07/2026 in the https://www.m.elewa.org/journals/journal-of-applied-biosciences-about-jab/ https://doi.org/10.35759/JABs.222.3

## ABSTRACT

*Objective :* This study aimed to document medicinal plants used in the traditional management of infertility and erectile dysfunction in the Zinder Region of Niger and to assess their relative ethnobotanical importance using quantitative indices.

*Methodology and Results :* A descriptive cross-sectional ethnobotanical survey was conducted between April and July 2024 among 40 traditional practitioners across five administrative areas of the Zinder Region. Semi-structured interviews in Hausa were used to collect data, and the relative importance of plant species was evaluated using citation frequency (CF), use value (UV), and informant consensus factor (ICF).In total, 69 plant species were documented: 35 for infertility, 48 for erectile dysfunction, with 14 species shared between both indications. Practitioners reported 30 distinct infertility recipes and 51 for erectile dysfunction. Infertility remedies showed moderate consensus (ICF = 0.521), with Apocynaceae the most represented family (18.8%) and *Euphorbia hirta* L. the leading species (UV = 0.150). Erectile dysfunction remedies demonstrated higher consensus (ICF = 0.724), dominated by Rubiaceae (25.7%), with *Gardenia erubescens* most prominent (UV = 0.575).Oral administration was predominant for both conditions (93–94%), with powders the main dosage form (63–75%). In erectile dysfunction remedies, roots (48%) and bark (15.65%) were the most frequently used plant parts.

*Conclusion and Application of results* **:**The traditional pharmacopoeia of the Zinder region constitutes a rich and diverse therapeutic resource for reproductive health disorders. Species with high UV and ICF values (*Gardenia erubescens (*Golden Gardenia*)*, *Euphorbia hirta (*Asthma Weed*)*, *Glossonema boveanum ((*Desert Rose*)*, and *Fadogia agrestis (*Black Aphrodisiac) should be prioritized for phytochemical, pharmacological, toxicological and safety investigations. The frequent use of underground organs highlights the need for sustainable harvesting and conservation strategies.

**Keywords**: infertility; erectile dysfunction; medicinal plants; Zinder; Niger.

## INTRODUCTION

Infertility and erectile dysfunction are major reproductive health concerns with substantial medical, psychological, and social consequences (WHO, 2023 ; Zegers-Hochschild *et al.,* 2017). Infertility affects a considerable proportion of couples worldwide and may result from male, female, or combined factors, whereas erectile dysfunction is a common sexual disorder whose prevalence increases with age and the presence of chronic comorbidities (Nguyen *et al.,* 2020). Beyond their direct clinical impact, both conditions are frequently associated with marital distress, reduced self-esteem, and social stigma, which drives the use of alternative therapeutic solutions, particularly traditional herbal medicine (WHO, 2023; Friday, 2022). In numerous African societies, medicinal plants remain integral to healthcare systems (Abdullahi, 2011). They are used to treat a wide variety of diseases, including reproductive disorders, due to their availability, relatively low cost, and the cultural roots of traditional knowledge (Cunningham, 2001 ; WHO, 2023). Traditional medicine thus remains a pillar of care for many health issues, especially in areas where access to conventional care remains limited or unequal (WHO, 2013). In Niger, and especially in the Zinder region, floristic diversity, the richness of ethnomedical knowledge, and the persistence of indigenous therapeutic practices provide a favourable context for investigating traditional plant uses. Knowledge related to the treatment of infertility and erectile dysfunction is generally transmitted orally from one generation to the next, which makes it vulnerable to gradual erosion under the effects of urbanization, social change, and cultural transformation (Martin, 1995 ; Kamatenesi-Mugisha and Oryem-Origa, 2005). Its scientific documentation is therefore of particular importance for both cultural preservation and public health. Moreover, scientific interest in plants used for reproductive health is growing. Several plant species traditionally used in the treatment of sexual or fertility disorders have been the subject of pharmacological investigations highlighting antioxidant, anti-inflammatory, vasodilatory, hormone-modulating, or spermatoprotective activities (Gauthaman *et al.,* 2008 ; Moyo *et al.,* 2015). Such findings support the hypothesis that certain traditional remedies may contain active compounds useful for the development of phytomedicines or complementary health products (Heinrich *et al.,* 2021). Accordingly, the present study had a dual objective: first, to document and highlight the knowledge held by traditional practitioners in the Zinder Region; and second, to provide a scientific basis for further phytochemical, pharmacological, and toxicological research (Martin, 1995 ; Heinrich *et al.,* 2021). In this way, the study contributes to the advancement of evidence-informed traditional medicine while respecting indigenous knowledge systems and established ethical principles of research (WHO, 2023).

## MATERIALS AND METHODS

**Study design and setting:** This study was a descriptive cross-sectional ethnobotanical survey conducted in the Zinder Region of Niger. The investigation covered five administrative areas of the Zinder Region: Tanout (north), Magaria (south), Takeita (west), Mirriah (east), and Zinder city (central area) (Figure 1). These sites were selected on the basis of geographical representativeness, accessibility, and the recognized use of medicinal plants.

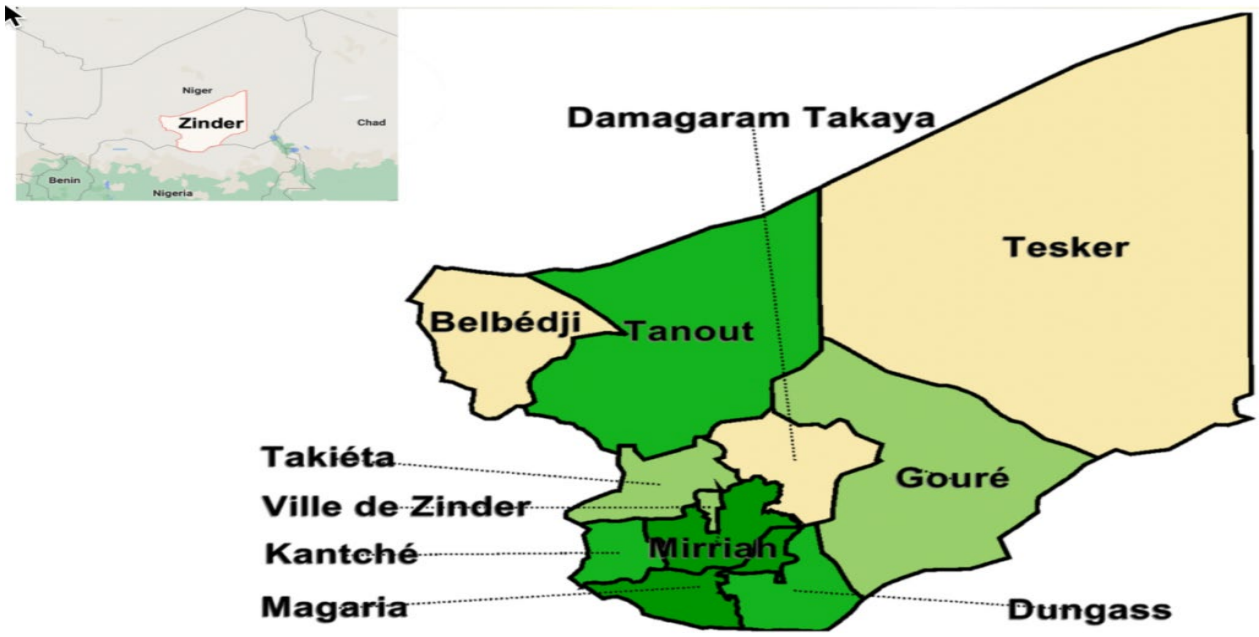


**Figure 1**: Administrative map of the Zinder Region

**Study population:** The target population included traditional practitioners, herbalists, and traditional healers practicing in the region. In addition, elderly individuals recognized in the community for their knowledge of traditional pharmacopoeia were approached. Eligible participants were individuals aged 18 years or older, locally recognized as holders of traditional ethnomedical knowledge, resident in the study area for at least one year, and willing to provide free and informed consent. Infertility was documented as reported by informants, without a priori restriction to male or female causes. During the semi-structured interviews, all 40 practitioners explicitly reported using plant-based remedies for three types of infertility: male infertility (characterized by low sperm count (ologospermia), reduced libido, or poor semen quality), female infertility (characterized by menstrual irregularities or failure to conceive), and mixed or undetermined infertility (cases where no sex-specific cause was identified by the practitioner). This three-category distinction, based on indigenous diagnostic terminology, was systematically recorded during each interview. The species inventory reflects this diversity: several species with documented effects on spermatogenesis and androgen levels (e.g., *Euphorbia hirta*, *Zingiber officinale*, *Nigella sativa*) coexist in the pharmacopoeia with species more commonly associated with female reproductive function (e.g., *Moringa oleifera*, *Carica papaya).* This distinction was recorded at the recipe level, where informants made it explicit.

**Sampling:** A purposive non-probability sampling strategy was used. Participant recruitment continued until data saturation was reached. The minimum sample size was initially set at 30 traditional practitioners in accordance with recommendations commonly used in ethnobotanical research. This sample size is consistent with methodological recommendations in the ethnobotanical literature, where surveys targeting specialist informants typically rely on 20 to 60 practitioners (Martin, 1995; Tardío & Pardo-de-Santayana, 2008; Bernard, 2006). The final sample of 40 practitioners is also comparable to similar surveys conducted in West Africa on reproductive health (Azonbakin *et al.,* 2021; Ouattara *et al.,* 2023). The purposive selection

of recognized holders of ethnomedical knowledge, rather than random community sampling, strengthens the relevance of the data collected relative to sample size. Data saturation was defined as the point after which no additional plant species were documented in subsequent interviews. For infertility, saturation was achieved at recipe R29 (35 cumulative species), and for erectile dysfunction at recipe R49 (48 cumulative species), confirming that the sample size (n=40) was sufficient to capture the majority of the local pharmacopoeia. (Figure 2).

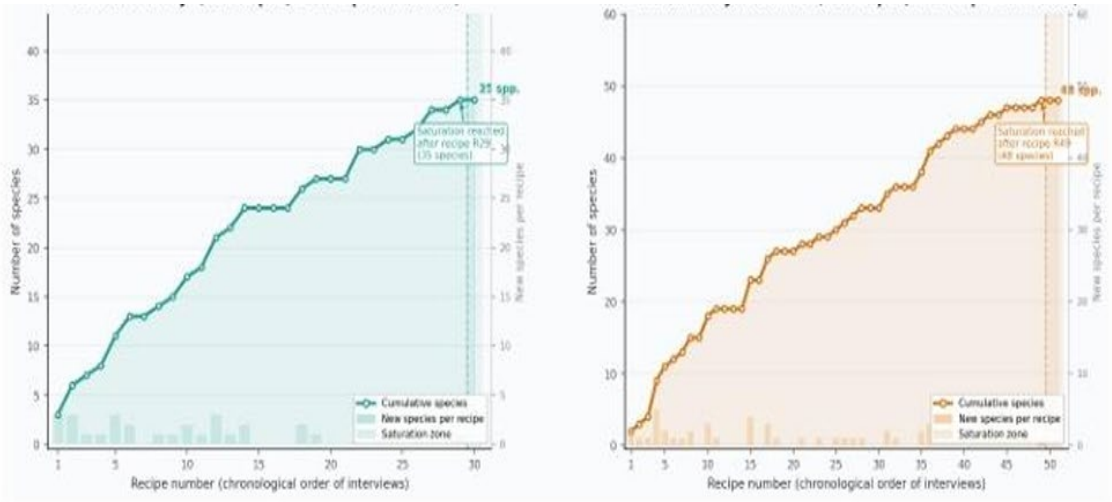


**Fig 2**. Species accumulation curves. Quantitative ethnobotanical survey in the Zinder Region, Niger (April-july 2024)

**A** : infirtility (30 recipes, n= 40 practitioners) **B** : erectile dysfunction (51 recipes, n= 40 practitioners)

**Data collection:** Data were collected through face-to-face semi-structured interviews conducted in Hausa. Whenever possible, interviews were supplemented by direct visual examination of plant materials presented by practitioners. The questionnaire covered participant sociodemographic characteristics, professional status within traditional practice, plant species used, vernacular and scientific names, plant parts used, methods of preparation, routes of administration, dosage practices, duration of treatment, plant combinations, reported adverse effects, and source of knowledge. The tool was pretested in a pilot survey involving 10 participants and subsequently revised. (Martin, 1995; Cotton, 1996). Data collection proceeded in three stages: first, a preliminary literature review was undertaken to identify previous studies and compile a preliminary list of species. No comparable study specifically addressing infertility and erectile dysfunction in the study area was identified. Second, field investigations were conducted over a period of three months and ten days, from 16 April to 24 July 2024. Third, information was triangulated through repeated market observations, plant photography, and group discussions with peer validation among practitioners.

**Botanical Identification:** The plants cited by informants were first recorded under their vernacular names and then identified through comparison with standard floristic references (Adam *et al.,* 1972; Peyre De Fabrègues, 1979 ; OOAS, 2020), with final verification provided by a botanist co-author (Karim Saley, Faculty of Science and Technology, Dan Dicko Dankoulodo University of Maradi). In keeping with recommendations concerning equitable engagement with knowledge holders and with the principles of the Convention on Biological Diversity, voucher specimens were not

systematically collected from the wild to establish a conventional herbarium. Instead, plant materials used in remedies (roots, bark, seeds, and leaves) were obtained directly from practitioners, thereby acknowledging their contribution and preserving a relationship of trust. Although this approach limited the constitution of a formal herbarium collection, photographs and associated descriptive metadata (vernacular name, plant part used, dosage form) were archived as photographic vouchers. (Figures 3).


**Fig 3a**: Display of medicinal plant materiels by a traditional practitioner; **3b**: Recipe used in the management of erectile dysfunction; **3c**: Root of *Fadogia agrestis*; **3d**: Recipe based on *Euphorbia hirta;* **3e**: Recipe based on *Glossonema boveanum ;* **3f**: Root of *Gardenia erubescens.*

**Variables and ethnobotanical indices:** The main variables included scientific and vernacular plant names, the botanical family, plant part used, preparation method, route of administration, frequency of citation, therapeutic indication, use value, treatment combinations, reported adverse effects, and perceived efficacy. Data were entered using Excel (2019) and analysed using SPSS version 25. Descriptive statistics were used to summarize participant characteristics and reported plant uses. Quantitative ethnobotanical analysis relied on citation frequency (CF); use value (UV = CF/n, where n = 40 informants) (Phillips and Gentry, 1993); and the informant consensus factor (ICF): $\boldsymbol{ICF = \frac{Nc-Nt}{Nc-1}}$ **Equation 1** (with Nc = total number of citations and Nt = number of taxa) (Trotter and Logan, 1986)

A recipe was defined as a distinct therapeutic preparation described by one or more informants, characterized by a specific combination of plant ingredients (species and parts used), preparation method (powder, decoction, infusion, maceration, or mastication), and administration vehicle (water, milk, food, or fumigation). Two preparations were counted as distinct recipes when they differed in at least one of the following criteria: plant species composition,

plant part used, preparation method, or vehicle. In cases where two or more informants independently described preparations with identical characteristics for the same therapeutic indication, these were merged into a single recipe entry to avoid duplication. Recipes were recorded and numbered independently for each condition (infertility and erectile dysfunction). A total of 30 recipes were documented for infertility and 51 for erectile dysfunction, with detailed composition provided in the Annexe (Tables 1 and 2). A value of ICF ≥ 0.60 was considered indicative of satisfactory consensus among informants (Trotter & Logan, 1986). Variables of interest included the local and scientific name, botanical family, part used, method of preparation, route of administration, and adverse effects (Leonti, 2022 ; Tardío and Pardo-de-Santayana, 2008). Note that several species are used for both conditions, hence the sum of species reported for each indication exceeds the total number of species recorded. Of the 69 plant species documented overall, 14 were cited for both infertility and erectile dysfunction (35 + 48 − 69 = 14). For analytical purposes, the two conditions were treated as independent datasets: citation frequencies and use values were calculated separately for each indication using the same denominator (n = 40 informants). Species cited for both conditions therefore appear in both Table 2 and Table 3, with their respective citation frequencies and use values calculated independently for each indication. The informant consensus factor (ICF) was likewise calculated separately using the pool of citations and taxa specific to each condition.

## RESULTS

**Sociodemographic characteristics of the practitioners surveyed:** The study included 40 traditional practitioners (mean age 48.17 ± 11.73 years). The majority were aged 50–59 years (30.00%). Men accounted for 97.50% of respondents. Knowledge transmission was predominantly familial (82.50%), and 75.00% reported more than 20 years of practice. Agriculture was the most common secondary occupation (42.50%) (Table 1).

**Species diversity and ethnobotanical importance of plants used for infertility:** The survey documented 30 distinct recipes for the treatment of infertility, comprising 72 botanical citations distributed across 35 species belonging to 24 botanical families (Table 2). The Informant Consensus Factor (ICF) was 0.521. The most frequently cited species were *Euphorbia hirta* (UV = 0.150), followed by *Glossonema boveanum*, *Syzygium aromaticum, Zingiber officinale* Roscoe (UV = 0.125 each). Other frequently reported species included *Nigella sativa* (UV = 0.100) and *Scoparia dulcis* (UV = 0.100). *Apocynaceae* was the most represented family (18.80 %), followed by the *Euphorbiaceae* (9.30%), *Zingiberaceae,* and *Myrtaceae* (6.97 % each), (Figure 4). Whole plants (28.41 %), seeds (18.18 %), and roots (15.91 %) were the most commonly used parts. (Figure 5).

**Table 1**: Sociodemographic characteristics of traditional practitioners (n = 40)

| Characteristics | Number of participants (n=40) | Percentage (%) |
|---|---|---|
| Age | | |
| 24–39 years | 9 | 22.50 |
| 40–49 years | 9 | 22.50 |
| 50–59 years ★ | 12 | 30.00 |
| ≥ 60 years | 10 | 25.00 |
| Mean ± SD : 48.17 ± 11.73 years (range : 24–70 years) | | |
| Gender | | |
| Male ★ | 39 | 97.50 |
| Female | 1 | 2.50 |
| Source of training | | |
| Family tradition ★ | 33 | 82.50 |
| Apprenticeship and training | 7 | 17.50 |
| Length of experience | | |
| 2–5 years | 3 | 7.50 |
| 6–10 years | 3 | 7.50 |
| 11–15 years | 2 | 5.00 |
| 16- 20 years | 2 | 5.00 |
| >20 years ★ | 30 | 75.00 |
| Secondary occupation | | |
| Agriculture ★ | 17 | 42.50 |
| Livestock farming | 4 | 10.00 |
| Other | 5 | 12.50 |
| None | 14 | 35.00 |
| Total | 40 | 100 |

★ *Dominant category.*

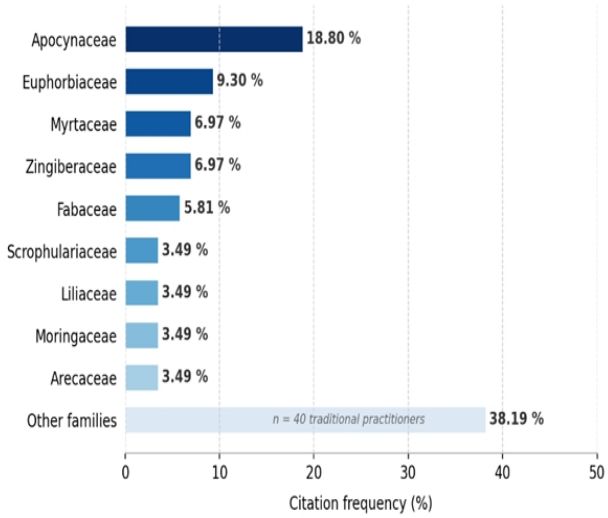


**Figure 4.** Botanical families cited in traditional infertility treatment in the Zinder region (n = 40 traditional practitioners).

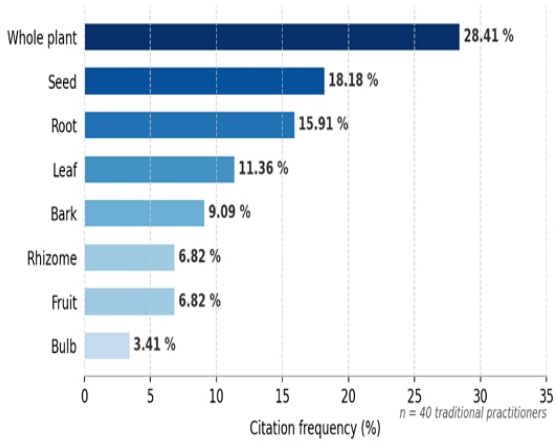


**Figure 5.** Distribution of plant parts used in traditional infertility treatment by informants in the Zinder region (n = 40 traditional practitioners).

**Table 2**: Plant species used for the management of infertility

| Species | Family | Local name (Hausa) | Plant part | CF | CF (%) | UV | Rank |
|---|---|---|---|---|---|---|---|
| *Euphorbia hirta* L. | *Euphorbiaceae* | Nonan kurcia | Whole plant | 6 | 8.33 | 0.150 | **1** |
| *Glossonema boveanum (*Decne) Decne | *Apocynaceae* | Taringida | Whole plant | 5 | 6.94 | 0.125 | **2** |
| *Syzygium aromaticum* (L.) | *Myrtaceae* | Karanfani | Spice | 5 | 6.94 | 0.125 | **3** |
| *Zingiber officinale* Roscoe | *Zingiberaceae* | Citta | Rhizome | 5 | 6.94 | 0.125 | **4** |
| *Nigella sativa* L. | *Ranunculaceae* | Habatus sauda | Seed | 4 | 5.56 | 0.100 | **5** |
| *Scoparia dulcis* L. | *Plantaginaceae* | Rumafada | Whole plant | 4 | 5.56 | 0.100 | 6 |
| *Abrus precatorius* L. | *Fabaceae* | Idan zakara | Seed | 3 | 4.17 | 0.075 | 7 |
| *Calotropis procera* (Aiton) W.T.Aiton | *Apocynaceae* | Farar Bahulata | Root | 3 | 4.17 | 0.075 | 8 |
| *Carica papaya* L. | *Caricaceae* | Gonda | Leaf | 3 | 4.17 | 0.075 | 9 |
| *Trigonella foenum-graecum* L. | *Fabaceae* | Houlba | Seed | 3 | 4.17 | 0.075 | 10 |
| *Allium sativum L.* | *Amaryllidaceae* | Tafarnua | Bulb | 2 | 2.78 | 0.050 | 11 |
| *Cinnamomum verum* J.Presl | *Lauraceae* | Kirfa | Bark | 2 | 2.78 | 0.050 | 12 |
| *Cyperus esculentus* L. | *Cyperaceae* | Aya | Seed | 2 | 2.78 | 0.050 | 13 |
| *Garcinia kola* Heckel | *Clusiaceae* | Namijin Goro | Seed | 2 | 2.78 | 0.050 | 14 |
| *Indigofera tinctoria* L. | *Fabaceae* | Baaba | Trunk | 2 | 2.78 | 0.050 | 15 |
| *Moringa oleifera* Lam. | *Moringaceae* | Zogale | Leaf/Root | 2 | 2.78 | 0.050 | 16 |
| *Senegalia senegal* (L.) Britton. | *Fabaceae* | Kwaro da kowra | Gum | 1 | 1.39 | 0.025 | 17 |
| *Adansonia digitata* L. | *Malvaceae* | Kwanta kouka | Leaf | 1 | 1.39 | 0.025 | 18 |
| *Asparagus africanus* Lam. | *Asparagaceae* | Farar bahulata | Whole plant | 1 | 1.39 | 0.025 | 19 |
| *Citrullus colocynthis* (L.) Schrad. | *Cucurbitaceae* | Guna | Leaf | 1 | 1.39 | 0.025 | 20 |
| *Citrullus lanatus (*Thunb.) Matsum. | *Cucurbitaceae* | Kankana | Seed | 1 | 1.39 | 0.025 | 21 |
| *Cochlospermum tinctorum* A.Rich. | *Bixaceae* | Rawaya | Root | 1 | 1.39 | 0.025 | 22 |
| *Crotalaria pallida* Aiton | *Fabaceae* | Farar biyar rana | Root | 1 | 1.39 | 0.025 | 23 |
| *Cucumis prophetarum* L. | *Cucurbitaceae* | Kakuji | Fruit | 1 | 1.39 | 0.025 | 24 |
| *Dolomiaea costus (*Falc.) Kasana | *Asteraceae* | Custus indi | Root | 1 | 1.39 | 0.025 | 25 |
| *Euphorbia aegyptiaca* Boiss. | *Euphorbiaceae* | Nonan yankamanci | Whole plant | 1 | 1.39 | 0.025 | 26 |
| *Fadogia agrestis* Schweinf.ex Hiern | *Rubiaceae* | Bakin gagey | Root | 1 | 1.39 | 0.025 | 27 |
| *Ficus gnaphalocarpa (*Miq.) | *Moraceae* | Bawre | Bark | 1 | 1.39 | 0.025 | 28 |
| *Gardenia erubescens* (Stapf & Hutch.) | *Rubiaceae* | Gaude | Root | 1 | 1.39 | 0.025 | 29 |
| *Paspalum scrobiculatum* L. | *Poaceae* | Takarama | Leaf | 1 | 1.39 | 0.025 | 30 |
| *Cenchrus americanum* (L.) Morrone | *Poaceae* | Daawa | Seed | 1 | 1.39 | 0.025 | 31 |
| *Phoenix dactylifera* L. | *Arecaceae* | Dabino | Fruit | 1 | 1.39 | 0.025 | 32 |
| *Polygala erioptera* DC. | *Polygalaceae* | Rafi | Bark | 1 | 1.39 | 0.025 | 33 |
| *Tamarindus indica* L. | *Fabaceae* | Tchamiya | Fruit | 1 | 1.39 | 0.025 | 34 |
| *Zanthoxylum xanthoxyloides* (Lam.) Zepem & Timler | *Rutaceae* | Fasa kwari | Bark | 1 | 1.39 | 0.025 | 35 |
| **TOTAL** | | | | **72** | **100.00** | **ICF = 0.521** | |

n= 40, Total citations Nc =72, Taxa : Nt = 35; UV : use value; CF : Citation Frequency; $UV = \frac{CF}{n}$. $ICF = \frac{NC-Nt}{NC-1} = \frac{72-35}{72-1} = 0.521$ (Phillips and Gentry, 1993).

**Species diversity and ethnobotanical importance of plants used for erectile dysfunction:** For erectile dysfunction, 51 distinct recipes were recorded, representing 171 use citations and 48 species distributed across at least 27 botanical families (Table 3). The ICF was 0.724, the most frequently cited species were *Gardenia erubescens* (UV = 0.575), followed by *Capsicum frutescens*, and *Fadogia agrestis* (UV = 0.300 each). Other highly ranked species included *Hymenocardia acida* (UV = 0.250) and *Pausinystalia yohimbe* (UV = 0.225). Rubiaceae was the dominant family (25.70 % of citations), followed by Fabaceae (8.00 %), *Euphorbiaceae*, and *Solanaceae* (7.00 % each) (Figure 6). Roots (48.30 %), and bark (15.65%), were the most frequently used plant part (Figure 7).

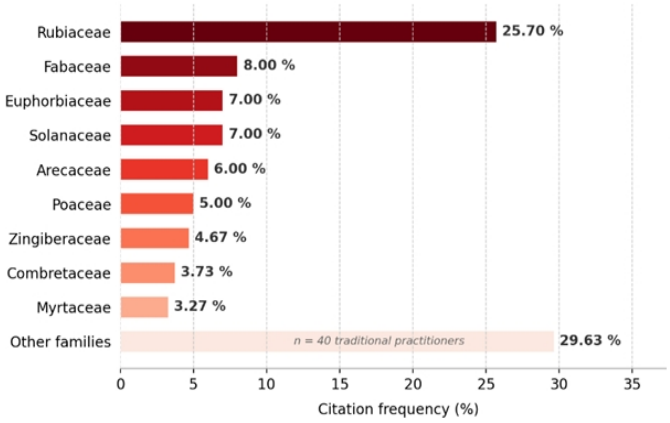


**Figure 5.** Botanical families cited in traditional erectile dysfunction treatment in the Zinder region (n = 40 traditional practitioners).

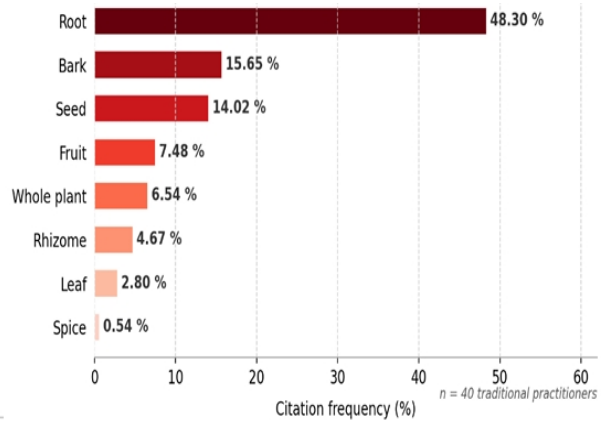


**Figure 6:** Distribution of plant parts used in traditional erectile dysfunction treatment by informants in the Zinder region (n = 40 traditional practitioners).

**Table 3**: Plant species used for the management of erectile dysfunction : (n = 40)

| Species | Family | Local name (Hausa) | Plant part | CF | CF (%) | UV | Rank |
|---|---|---|---|---|---|---|---|
| *Gardenia erubescens* Stapf & Hutch. | *Rubiaceae* | Gaude | Root | 23 | 13.45 | 0.575 | **1** |
| *Capsicum frutescens* L. | *Solanaceae* | Sidahu | Fruit | 12 | 7.02 | 0.300 | **2** |
| *Fadogia agrestis* Schweinf.ex Hiern | *Rubiaceae* | Bakin gagey | Root | 12 | 7.02 | 0.300 | **3** |
| *Hymenocardia acida* Tul. | *Phyllanthaceae* | Farin gagey | Root | 10 | 5.85 | 0.250 | **4** |
| *Pausinystalia yohimbe* (K.Schum.) Pierre ex Beille | *Rubiaceae* | Dan kamarou | Bark | 9 | 5.26 | 0.225 | **5** |
| *Zanthoxylum xanthoxyloides* (Lam.) | *Rutaceae* | Fasa kwari | Bark | 9 | 5.26 | 0.225 | 6 |
| *Linum usitatissimum* L. | *Linaceae* | Koulla | Seed | 8 | 4.68 | 0.200 | 7 |
| *Zingiber officinale* Roscoe | *Zingiberaceae* | Citta | Rhizome | 7 | 4.09 | 0.175 | 8 |
| *Borassus aethiopum* Mart. | *Arecaceae* | Mourutchi | Bark | 6 | 3.51 | 0.150 | 9 |
| *Loudetia phragmitoides* (Peter) C.E.Hubb. | *Poaceae* | Tchisiyar maza | Root | 6 | 3.51 | 0.150 | 10 |
| *Garcinia kola* Heckel | *Clusiaceae* | Namijin Goro | Seed | 5 | 2.92 | 0.125 | 11 |
| *Paullinia pinnata* L. | *Sapindaceae* | Tourakou | Root | 5 | 2.92 | 0.125 | 12 |
| *Syzygium guineense* (Willd.) DC. | *Myrtaceae* | Malmo | Bark | 5 | 2.92 | 0.125 | 13 |
| *Waltheria indica* L. | *Malvaceae* | Hankoufa | Root | 5 | 2.92 | 0.125 | 14 |
| *Cola acuminata* (P.Beauv.) | *Malvaceae* | Goro | Seed | 4 | 2.34 | 0.100 | 15 |
| *Combretum aculeatum* Vent. | *Combretaceae* | Farar geza | Root | 3 | 1.75 | 0.075 | 16 |
| *Combretum glutinosum* Perr.ex DC. | *Combretaceae* | Farar geza | Root | 3 | 1.75 | 0.075 | 17 |
| *Senegalia polycantha* (Willd.) Seigler & Ebinger | *Fabaceae* | Karaki | Bark | 2 | 1.17 | 0.050 | 18 |
| *Allium sativum* L. | *Amaryllidaceae* | Tafarnua | Bulb | 2 | 1.17 | 0.050 | 19 |
| *Hygrophila auriculata* (Schumach.) | *Acanthaceae* | Zazar giwa | Seed | 2 | 1.17 | 0.050 | 20 |
| *Moringa oleifera* Lam. | *Moringaceae* | Zogale | Leaf/Root | 2 | 1.17 | 0.050 | 21 |
| *Nigella sativa* L. | *Ranunculaceae* | Habatus soda | Seed | 2 | 1.17 | 0.050 | 22 |
| *Ocimum americanum* L. | *Lamiaceae* | Kimba | Seed | 2 | 1.17 | 0.050 | 23 |
| *Syzygium aromaticum* (L.) | *Myrtaceae* | Kāranfāni | Flower bud | 2 | 1.17 | 0.050 | 24 |
| *Trigonella foenum-graecum* L. | *Fabaceae* | Houlba | Seed | 2 | 1.17 | 0.050 | 25 |
| *Senegalia ataxacantha* (DC). Kyal. & Boatwr | *Fabaceae* | Sarkiya | Root | 1 | 0.58 | 0.025 | 26 |
| *Artemisia vulgaris* L. | *Asteraceae* | Tazargade | Whole plant | 1 | 0.58 | 0.025 | 27 |
| *Citrus limon* (L.) Burm.f. | *Rutaceae* | Lemout tchami | Fruit | 1 | 0.58 | 0.025 | 28 |
| *Clerodendrum capitatum* (Willd.) | *Lamiaceae* | Sayawar maza | Root | 1 | 0.58 | 0.025 | 29 |
| *Combretum sericeum* G.Don | *Combretaceae* | Taro | Root | 1 | 0.58 | 0.025 | 30 |
| *Crossopteryx febrifuga* (G.Don) | *Rubiaceae* | Makarko | Root | 1 | 0.58 | 0.025 | 31 |
| *Cucumis metuliferus* E.Mey.ex Naudin | *Cucurbitaceae* | Zazar zaki | Seed | 1 | 0.58 | 0.025 | 32 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Cymbopogon schoenanthus* (L.) | *Poaceae* | Tchabre | Whole plant | 1 | 0.58 | 0.025 | 33 |
| Cyperus esculentus L. | *Cyperaceae* | Aya | Seed | 1 | 0.58 | 0.025 | 34 |
| *Dichrostachys cinerea* (Forssk.) | *Fabaceae* | Doundou | Root | 1 | 0.58 | 0.025 | 35 |
| *Diospyros mespiliformis* Hochst. | *Ebenaceae* | Yari | Seed | 1 | 0.58 | 0.025 | 36 |
| *Dolomiaea costus* (Falc.) Kasana | *Asteraceae* | Custus indi | Root | 1 | 0.58 | 0.025 | 37 |
| *Feretia apodanthera* Del. | *Rubiaceae* | Kouroukorou | Root | 1 | 0.58 | 0.025 | 38 |
| *Manihot esculenta* Crantz | *Euphorbiaceae* | Rogo | Root | 1 | 0.58 | 0.025 | 39 |
| *Phoenix dactylifera* L. | *Arecaceae* | Dabino | Root | 1 | 0.58 | 0.025 | 40 |
| *Piliostigma reticulatum* (DC.) Hochst. | *Fabaceae* | Galgo | Fruit | 1 | 0.58 | 0.025 | 41 |
| *Piper guineense* Schumach.& Thonn. | *Piperaceae* | Massoro | Leaf | 1 | 0.58 | 0.025 | 42 |
| *Solanum incanum* L. | *Solanaceae* | Idan sania | Seed | 1 | 0.58 | 0.025 | 43 |
| *Tamarindus indica* L. | *Fabaceae* | Tchamiya | Bark | 1 | 0.58 | 0.025 | 44 |
| *Tephrosia linearis* (Willd.) Pers. | *Fabaceae* | Sinsiyar mahalba | Fruit | 1 | 0.58 | 0.025 | 45 |
| *Tephrosia purpurea* (L) Pers. | *Fabaceae* | Maragoua | Root | 1 | 0.58 | 0.025 | 46 |
| *Tribulus terrestris* L. | *Zygophyllaceae* | Tsada | Root | 1 | 0.58 | 0.025 | 47 |
| *Ziziphus mucronata* Willd. | *Rhamnaceae* | Magaria | Root | 1 | 0.58 | 0.025 | 48 |
| **TOTAL** | | | | **171** | **100.00** | **ICF = 0.724** | |

n= 40; $UV = \frac{CF}{n}$, *(Nc : total citations : NC = 171, Taxa : Nt = 48)* $ICF = \frac{Nc-Nt}{Nc-1} = \frac{171-48}{171-1} = 0.724$

**Comparative analysis of shared species and prescription characteristics:**

**Species common to both indications:** Fourteen species were shared between infertility and erectile dysfunction (Table 4). Marked differences in use value were observed, indicating condition-specific ethnobotanical specialization. *Gardenia erubescens* (UV = 0.575 in ED vs 0.025 in infertility) and *Fadogia agrestis* (UV = 0.300 vs 0.025) showed strong specialization toward erectile dysfunction. Conversely, *Euphorbia hirta* was more strongly associated with infertility.

**Table 4**: Species common to both indications (n =40)

| Species | Family | Hausa | UV (Infertility) | UV (erectile dysfunction) |
|---|---|---|---|---|
| *Allium sativum* L. | Amaryllidaceae | Tafarnua | 0.050 | 0.050 |
| *Cyperus esculentus* L. | Cyperaceae | Aya | 0.050 | 0.025 |
| *Dolomiaea costus* (Falc.) Kasana | Asteraceae | Custus indi | 0.025 | 0.025 |
| *Fadogia agrestis* Schweinf. | Rubiaceae | Bakin gagey | 0.025 | **0.300** |
| *Garcinia kola* Heckel | Clusiaceae | Namijin Goro | 0.050 | **0.125** |
| *Gardenia erubescens* (Stapf & H.) | Rubiaceae | Gaude | 0.025 | **0.575** |
| *Moringa oleifera* Lam. | Moringaceae | Zogale | 0.050 | 0.050 |
| *Nigella sativa* L. | Ranunculaceae | Habatus soda | 0.100 | 0.050 |
| *Phoenix dactylifera* L. | Arecaceae | Dabino | 0.025 | 0.025 |
| *Syzygium aromaticum* (L.) | Myrtaceae | Karanfani | 0.125 | 0.050 |
| *Tamarindus indica* L. | Fabaceae | Tchamiya | 0.025 | 0.025 |
| *Trigonella foenum-graecum* L. | Fabaceae | Houlba | 0.075 | 0.050 |
| *Zanthoxylum xanthoxyloides* (Lam.) | Rutaceae | Fasa kwari | 0.025 | **0.225** |
| *Zingiber officinale* Roscoe | Zingiberaceae | Citta | 0.125 | **0.175** |

*Total unique species : 35 (infertility) + 48 (erectile dysfunction) – 14 (common) = 69 species overall*.

**Preparation methods and administration patterns:** The oral route was overwhelmingly predominant (93.33 % infertility; 94.11 % ED). Powdered formulations were the most common preparation (63.33 % infertility; 74.50 % ED). Continuous or undefined treatment duration was frequently reported (70% infertility; 64.70% ED). Adverse effects were largely unknown (93–100%) (**Table 5**).

**Comparative quantitative patterns:** Compared with infertility, erectile dysfunction showed a higher level of informant consensus (ICF = 0.521 vs. 0.724) suggesting a stronger convergence in reported therapeutic practices and more homogeneous knowledge transmission. The exceptional UV of *Gardenia erubescens* (0.575) far exceeds the maximum observed for infertility (0.150), suggesting strong species centralization in erectile dysfunction management**.**

**Table 5**: Comparative characteristics of prescriptions : infertility versus erectile dysfunction

| Variable | Infertility (n=30) | Erectile dysfunction (n=51) |
|---|---|---|
| Oral route ★ | 28 (93.33 %) | 48 (94.12 %) |
| Inhalation | 2 (6.67 %) | 2 (3.91 %) |
| Mucosal application | — | 1 (1.97 %) |
| Powder ★ | 19 (63.33 %) | 38 (74.51 %) |
| Infusion | 5 (16.67 %) | 1 (1.96 %) |
| Maceration | 4 (13.33 %) | 4 (7.84 %) |
| Decoction | 2 (6.67 %) | - |
| Chewed | - | 6 (11.77 %) |
| Others (oil, juice) | - | 2 (3.92 %) |
| Continuous use (unlimited)★ | 21 (70.00 %) | 33 (64.71 %) |
| ≤ 3 days | 7 (23.33 %) | 11 (21.57 %) |
| 7–10 days | 1 (3.33 %) | 2 (3.92 %) |
| Single use | 1 (3.33 %) | 5 (9.80 %) |
| Plants only ★ | 23 (76.67 %) | 38 (74.51 %) |
| Animal products | 4 (13.33 %) | 6 (11.76 %) |
| Mineral products | 2 (6.67 %) | 7 (13.73 %) |
| Other | 1 (3.33 %) | - |
| Unknown ★ | 28 (93.33 %) | 51 (100 %) |
| Polyuria | 2 (6.67 %) | - |
| Undetermined ★ | 25 (83.33 %) | ND |
| > 1 month | 4 (13.33 %) | ND |
| ≤ 1 month | 1 (3.33 %) | ND |
| < 1 000 | ND | 15 (29.41 %) |
| [1 000 – 5 000[★ | ND | 28 (54.90 %) |
| [5 000 – 10 000[ | ND | 6 (11.76 %) |
| [10 000 – 50 000[ | ND | 2 (3.92 %) |

★ *Dominant modality, ND = not documented for this condition. FCFA =CFA: French Communities of Africa.*

## DISCUSSION

This study provides quantitative ethnobotanical data on medicinal plants used in the traditional management of infertility and erectile dysfunction in the Zinder Region of Niger. The findings reveal a substantial body of therapeutic knowledge structured around two major reproductive health concerns, with notable differences in species richness, consensus, and plant-part selection between the two indications.

**Practitioners traditional profile and knowledge transmission:** The predominance of family-based knowledge transmission (82.50 %) and the high proportion of respondents reporting more than 20 years of experience (75.00 %) indicate that the documented knowledge is largely held by socially recognized specialists. In ethnobotanical research, this profile is often associated with greater depth of plant knowledge, especially for culturally sensitive disorders. Family-based transmission suggests that reproductive health knowledge remains embedded in hereditary and lineage-based systems of learning, as reported in other West African settings (Jazy *et al.,* 2017; Laouali *et al.,* 2020). Such transmission pathways may favour continuity, but they may also increase the vulnerability of this knowledge if younger generations show declining interest or reduced opportunities for apprenticeship. The near-exclusive male dominance observed in this study (97.5 %) reflects a broader pattern documented across Sahelian West Africa,

where therapeutic authority over reproductive and sexual disorders is often transmitted within male lineages and constitutes a form of social capital conferring status and economic power within the community (Jazy *et al.,* 2017; Ouattara *et al.,* 2023). Cultural taboos surrounding female sexuality and infertility may limit women's public visibility in this domain (Kamatenesi-Mugisha & Oryem-Origa, 2005; Moyo *et al.,* 2015). Future studies should therefore specifically target female practitioners and midwives. These findings are consistent with reports from Benin but differ from Dahounom et al. (2021) in Togo, where women predominated. The high proportion of respondents engaged in agriculture reflects the broader socioeconomic structure of Niger (INS, 2023).

**Condition-specific knowledge patterns: infertility versus erectile dysfunction:** The two conditions differed in both species richness and degree of consensus. Erectile dysfunction was associated with a higher ICF (0.724) than infertility (0.521), suggesting stronger convergence of therapeutic knowledge (Trotter & Logan, 1986; Leonti, 2022). In the present case, this may indicate that erectile dysfunction is recognized through more homogeneous therapeutic categories and managed with a more focused pharmacopoeia. By contrast, the lower consensus observed for infertility likely reflects the broader and more heterogeneous way in which infertility is locally understood. In this survey, practitioners explicitly referred to male, female, and mixed or undetermined infertility. Such plurality of diagnostic categories may partly explain the greater diversity of plants reported and the lower consensus index. Rather than indicating weak knowledge, this pattern may reflect the multifactorial nature of infertility and the coexistence of sex-specific, couple-based, and symptom-based explanatory frameworks. From an ethnopharmacological perspective, this distinction is important because high plant diversity in one indication may correspond not to therapeutic uncertainty, but to the complexity of the underlying illness category (Leonti, 2022).

**Ethnopharmacological significance of dominant families and priority species:** The predominance of Apocynaceae (18.80 %) among infertility remedies is noteworthy. This family includes numerous species rich in alkaloids, glycosides, and other bioactive secondary metabolites that may influence oxidative stress, endocrine pathways, or reproductive physiology (Heinrich *et al.,* 2021). Similar patterns have been reported in reproductive ethnomedicine elsewhere in West Africa (Azonbakin *et al.,* 2021; Nduche *et al.,* 2015). For erectile dysfunction, Rubiaceae was clearly dominant (25.70 %). This may reflect the reputed effects of several Rubiaceae species on vitality, circulation, and sexual performance in traditional medicine (Moyabi, 2021; Fred-Jaiyesimi *et al*. 2021). By contrast, *Euphorbia hirta* (0.150) emerged as most prominent for infertility. Experimental evidence supports its effects on sperm parameters (Ganiyu *et al.,* 2022). *Zingiber officinale* and *Nigella sativa* have also demonstrated androgen-modulating effects (Shalaby et *al.,*2010; Leisegang *et al.,* 2021). In the treatment of erectile dysfunction, *Gardenia erubescens* (UV = 0.575), *Fadogia agrestis* and *Capsicum frutescens* (UV = 0.300 each) were dominant. Species with high UV values may be considered priority candidates for further phytochemical, pharmacological and toxicological safety investigation, consistent with regional data (Sabo *et al.,* 2017; Fred-Jaiyesimi *et al.,* 2021) in Nigeria, (Harouna *et al.,* 2020) in Mali, establishing West African ethnobotanical consistency in the traditional management of this condition.

**Preparation practices, safety concerns, and conservation challenges:** Oral administration was overwhelmingly predominant for both infertility and erectile dysfunction, (93.33 %-94.11 %) and powdered preparations were the most common formulations (63.33 % and

74.50 %), similar patterns have been described in ethnobotanical studies from Benin, Togo, and Burkina Faso (Azonbakin *et al.,* 2021; Dahounom *et al.,* 2021; Ouattara *et al.* 2023). Powdered formulations are likely favoured for practical reasons, including relative stability, ease of storage under Sahelian climatic conditions, transportability, and flexibility of administration in water, milk, porridge, or other vehicles. These practical advantages probably contribute to their persistence across therapeutic traditions. However, the frequent prescription of continuous (70 % for infertility; 65 % for erectile dysfunction), or poorly delimited treatment durations raises important safety concerns. In both conditions, many remedies were reportedly used without a clearly defined duration, and adverse effects were rarely known or reported (93-100% reported as unknown). This does not necessarily imply an absence of toxicity but rather highlights the limitations of local pharmacovigilance and the tendency for "natural" remedies to be perceived as intrinsically safe. Given the pharmacological complexity of plant mixtures and the prolonged exposure implied by repeated use, these findings underscore the need for toxicological evaluation, particularly for remedies used chronically or involving highly bioactive taxa (Shalaby, 2010 ; Virtuoso *et al.,* 2024). Additionally, the heavy reliance on roots (48.30 %) and bark (15.65 %), particularly in remedies for erectile dysfunction, raises substantial conservation concerns. Destructive harvesting of these plant parts may threaten local populations of the most sought-after species (Laouali *et al.,* 2020), especially *Gardenia erubescens*. Sustainable harvesting strategies, domestication efforts, or substitution with less destructive plant parts should therefore be considered.

## CONCLUSION AND APPLICATIONS OF RESULTS

This ethnobotanical survey conducted among 40 traditional practitioners covering five administrative departments in the Zinder Region documented a substantial and heterogeneous pharmacopoeia comprising 69 plant species distributed across at least 35 botanical families that are used in the traditional management of infertility (35 species, ICF = 0.521) and erectile dysfunction (48 species, ICF = 0.724). Quantitative analysis identified priority species : *Euphorbia hirta* (UV = 0.150), *Glossonema boveanum* (UV = 0.125) for infertility. *Gardenia erubescens* (UV = 0.575), *Fadogia agrestis* (UV = 0.300) and *Capsicum frutescens* (UV = 0.300) for erectile dysfunction. These results confirm the predominance of the *Apocynaceae* and *Rubiaceae* families in the traditional management of reproductive disorders in the Hausa region and highlight a preference for oral administration and powdered preparations. The higher consensus observed for erectile dysfunction (ICF = 0.724) suggests greater standardization of treatments compared to infertility (ICF = 0.521), likely reflecting the multifactorial nature and diagnostic complexity of the latter. However, the intensive harvesting of roots (48.30 % of ED recipes) and bark (15.65 %) raises major ecological concerns regarding the sustainability of plant resources. The promotion of these traditional remedies must be accompanied by sustainable management strategies. These data provide a solid scientific foundation for further research in phytochemistry and pharmacology. The identification of the active compounds of *Gardenia erubescens* and *Fadogia agrestis*, in particular, may inform the future development of complementary therapeutic approaches for reproductive health in the Sahelian context.

**Study Limitations:** This study is limited by the subjective nature of the responses, the lack of understanding among some traditional

practitioners, the refusal of certain traditional practitioners to participate in the survey, and the difficulties in finding the scientific names of certain plants given in the local language. Additional limitations include the heterogeneity of knowledge among informants, the difficulty in identifying certain species by their vernacular names alone, and the variability of traditional preparations (Martin, 1995 ; Cunningham, 2001). Despite these limitations, rigorous data collection and triangulation of information helped strengthen the scientific quality of the data. Additionally, no voucher herbarium specimens were collected, which may limit independent taxonomic verification. The predominance of male informants may have limited the visibility of women-centered reproductive knowledge, especially regarding female infertility.

**ACKNOWLEDGMENTS**

The authors sincerely thank the traditional practitioners in the Zinder region for generously sharing their knowledge, as well as the regional association of traditional practitioners for its collaboration and logistical support. The authors also thank Karim Saley for assistance with botanical identification and all colleagues who contributed to the critical review of the manuscript.

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