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Medicinal plants proposed for the treatment of type 2 diabetes: an ethnobotanical study of twenty-five markets in Burundi

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Abstract

Background

Type 2 diabetes is a growing global challenge. Access to modern treatments is scarce, so many patients turn to traditional medicine despite little scientific validation. This study documents plants that are traditionally used for the treatment of type 2 diabetes and their applications.

Methods

An ethnobotanical survey was conducted throughout the national territory from February to August 2024; 64 traditional practitioners from 25 public markets used a semistructured questionnaire centered on the treatment of symptoms typical of diabetes. The participants were selected through purposive and snowball sampling. Data analysis was based on the frequency of citations, the relative frequency of citations, and the fidelity level.

Results

A total of 121 plant species from 51 families and 111 genera were identified. Asteraceae (14.87%) and Fabaceae (13.22%) were the most represented. The plants presented 30 diabetes-related symptoms, with 55 multiherbal recipes and eight monoherbal recipes. The most cited species were *Gymnanthemum amygdalinum* (FC 17%; RFC 0.27%; FL 26.56%), *Dicoma anomala* (FC 14%; RFC 0.22%; FL 21.9%), *Erythrina abyssinica* (FC 13%; RFC 0.20%; FL 18.8%) and *Parinari curatellifolia* (FC 12%; RFC 0.19%; FL 18.8%). Most species were phanerophytes (52.9%) and hemicryptophytes (22.3%), with leaves (52.4%) and bark (27%) being the most common. Decoction predominated (65.6%) and was mostly administered orally (97.6%).

Conclusion

Burundi’s ethnobotanical heritage is crucial for diabetes management. The documented plants are promising for developing effective, affordable, locally sourced phytomedicines, supporting indigenous knowledge and public health.

Background

Type 2 diabetes has emerged as one of the most prevalent and serious chronic diseases of our time, leading to fatal, disabling, and costly complications, as well as a marked reduction in life expectancy [1]. At the global level, the disease is now recognized as a pandemic, having affected an estimated 588.7 million people in 2024, with projections suggesting a rise to 852.5 million by 2050 [2]. While this trend is evident worldwide, an especially alarming rise is observed in sub-Saharan Africa, the only region where the proportion of individuals with the disease is predicted to increase by some 142% by 2050 [2].

Within this regional context, Burundi presents an equally concerning situation. Specifically, between 2011 and 2021, the national prevalence of diabetes tripled, rising from 2.7% to 6.5% [3], and approximately 60% of individuals with diabetes are estimated to be undiagnosed, largely due to limited healthcare infrastructure and resources [2, 4]. In this context, many patients turn to traditional medicine (TM), particularly herbal medicines, owing to both limited access to modern treatments and enduring cultural reliance on ancient healing methods [5, 6]. Indeed, as in many African countries, TM continues to play a crucial role in primary healthcare delivery in Burundi [5], and the popularity of medicinal plants among the general population is deeply rooted in cultural acceptance, perceived natural compatibility with the human body, and a probable perception of fewer side effects [7]. The use of medicinal plants for metabolic disorders closely aligns with long-standing ethnobotanical traditions; indeed, ethnobotany consistently reveals that local communities possess extensive empirical knowledge regarding plant-based treatments for a wide range of ailments, including diabetes-related symptoms [8]. This knowledge, often transmitted orally across generations, informs plant selection, harvesting practices, preparation methods, and therapeutic applications, reflecting a sophisticated understanding of local biodiversity [9, 10]. Building upon this knowledge, ethnopharmacology evaluates traditional remedies through pharmacological and biochemical analyses, bridging indigenous knowledge systems with modern scientific approaches and providing a framework for validating, contextualizing, and potentially integrating medicinal plants into evidence-based healthcare [11, 12]. Consistent with this perspective, the World Health Organization further endorses medicinal plants for diabetes management and calls for rigorous scientific evaluation of their hypoglycemic properties [13, 14]. In line with these recommendations, numerous studies across East Africa have documented antidiabetic plants and their phytochemical constituents, highlighting both the diversity of plant species used and the empirical knowledge guiding their selection and preparation [15–17]. Despite this regional attention, Burundi has received little research focus, and no comprehensive inventory of indigenous antidiabetic plants exists. Nevertheless, field observations indicate that Burundian individuals with type 2 diabetes (T2D) frequently rely on traditional remedies, suggesting the presence of rich, but undocumented, medical expertise. These observations point to a clear gap in scientific knowledge of local practices; ethnopharmacology has previously guided research in the Eastern African region, yet Burundi’s medicinal flora and associated local practices remain largely unexplored. Taken together, these considerations led to the hypothesis that Burundian traditional practitioners possess valuable knowledge for managing symptoms consistent with type 2 diabetes. The objective of this study was to identify medicinal plants used in the traditional treatment of type 2 diabetes symptoms across 25 markets throughout the nation.

Materials and Methods

Study area

The study was conducted in 25 markets located in five provinces defined by *"Organic law no. 1/05 of March 16 2023 on the delimitation of provinces, communes, zones, hills and/or districts of the Republic of Burundi"* (Fig. 1 & Table 1). The markets subject to our investigations are well represented in five provinces and five major agroecological regions of Burundi [18, 19], namely, (i) the central highlands, where ten markets were visited (52% of the territory; altitudes, 1350–2000 m; t°, 17–20°C; rainfall, 1200–1500 mm; varied but often degraded soils); (ii) Kumoso and Bugesera depressions, where two markets were visited (16% of the territory; altitudes, 1320–1500 m; t°, 20–23°C; rainfall, 1100–1700 mm); (iii) the Congo Nile ridge, where three markets were visited (15% of the territory; altitudes, 1700–2500 m; t°, 14–15°C; rainfall, 1300–2000 mm); and (iv) the western escarpment, where one market was visited (10% of the territory; altitudes, 1000 – 900 m; t°, 17–23°C; rainfall, 1100 – 900 mm; steep slopes; fertile but eroded soils); (v) the Imbo plain (including the city of Bujumbura, i.e., 10% of the Burundian population) [20]. This agroecological diversity allows Burundi to harbor a wide variety of indigenous plant species, whose socioeconomic and cultural contributions are multiple. Ntore et al.[21] recently identified 3,860 plant species in the vascular flora of Burundi, which were grouped into 1,290 genera and 216 families.

Table 1
Distribution of markets visited according to province, agroecological region and presence of traditional practitioners treating or not treating type 2 diabetes

Provinces	**Markets visited**	**Agroecological Regions**	**Traditional practitioners treating T2D**	**Traditional practitioners not treating T2D**
Buhumuza	Cankuzo	Central highlands	0	2
	Muyinga		1	4
	Ruyigi		2	3
Bujumbura	Bubanza	Western Escarpment	1	3
	Gitaza	Imbo Plain	3	2
	Jabe		17	10
	Kamenge		2	2
	Kanyosha		1	2
	Kinama		21	10
	Musaga		1	1
	Rugombo		1	1
	Ruziba		1	2
BURUNGA	Bururi	Congo Nile Ridge	0	3
	Buta		1	0
	Makamba	Kumoso and Bugesera Depressions	1	4
	Matana	Congo Nile ridge	0	3
	Rumonge	Imbo Plain	7	1
	Rutana	Central highlands	0	1
BUTANYERERA	Kayanza	Central highlands	0	3
	Kirundo	Kimoso and Bugesera Depressions	1	1
	Ngozi	Central highlands	1	4
GITEGA	Gitega	Central highlands	1	10
	Karusi		0	2
	Muramvya		1	3
	Mwaro		0	5

Data collection

A semistructured questionnaire was specifically developed for the present study and used to conduct the ethnobotanical survey from February to August 2024 (Supplementary file 1). A total of 146 tradipraticians were selected by purposive and snowball sampling, from whom 64 practitioners effectively treated the symptoms of type 2 diabetes. A questionnaire, initially in French, translated into *Kirundi* (local language), collected information on the practitioners (name, age, sex, marital status, level of education, locality), their traditional medicine practices (specialty, duration of practice, origin of knowledge, diagnostic methods, knowledge and identification of type 2 diabetes, side effects, eventual prohibitions and dietary recommendations) and the recipes they offered to diabetic patients (vernacular names of plants, part of the plant used, origin of the plant and postharvest treatment, combinations of plants, nonplant ingredients, preparation methods, routes of administration, dosages, and possible additional practices). The weight of the plants used for the preparation of the recipes was estimated according to the method described by Chifundera [22]. This study followed the principles set out in the latest version of the Declaration of Helsinki [23]. In all the cases, informed consent was obtained from the respondents for the disclosure of anonymized information except for two informants, who represented 2% of our sample. Data collection was also conducted under the research authorization issued by the Directorate of Research and Innovation of the University of Burundi. Monetary incentives, equivalent to the amount of a consultation, were offered as compensation for the time spent. The approach to some traditional practitioners has been somewhat sensitive, as they are visibly seeking to protect their knowledge and activity. We hope to mitigate this reluctance by detailing the objectives of the study.

Collection and identification of medicinal plant samples used in Burundi against type 2 diabetes

The interviewed traditional practitioners were involved in the recognition and collection of herbarium samples. They also contributed to the preliminary stage of specimen identification by assigning vernacular names. The formal identification of the plant was carried out by, Prof. Jacques Nkengurutse of the University of Burundi and Dr. Salvator Ntore of Meise Botanical Garden (Belgium). In addition, a voucher specimen of this material has been deposited at the Herbarium of the University of Burundi (BJA) and the Herbarium of the Meise Botanical Garden (BR). This identification was completed via relevant taxonomic literature, the online world flora database and African plant database and available documentary resources [24–26]. The orders and families of flowering plants were classified according to the APG IV system [27].

Data processing and analysis

The collected ethnobotanical data were analysed via quantitative methods, resulting in the following conclusions:

- The frequency of citation (FC), which corresponds to the number of informants mentioning the use of a particular plant species for so-called *"antidiabetic"* use (i.e., for symptoms compatible with type 2 diabetes),
- The relative frequency of citations (RFC) is calculated according to Tardio & Pardo-de-Santayana [28] (Eq. 1):

$$FRC = \frac{\text{Frequency of citation}}{\text{Total number of informants}}$$

- The level of fidelity (FL), which, for a given plant, corresponds to the proportion (%) of informants who claim to recommend it for so-called *"antidiabetic"* use (Eq. 2) [29].

$FL\,(\%) = \frac{Np}{N} X10$ 0 (Eq. 2)

(Np, number of informants who reported using a plant species to treat type 2 diabetes; N, total number of informants)

Graphical data overview

The relationships between recipes and cited plants were graphically represented as an interaction network using Cytoscape_v3.10.2 software (https://cytoscape.org) with an organic layout [30–32].

Results and Discussion

Characteristics of traditional practitioners

The study surveyed 64 traditional practitioners in Burundi, revealing a sociodemographic profile that aligns with the national context. Over half of the participants were aged over 51 years (53.2%), the majority were married (85.9%), and most had a low level of education, limited to primary school or lower (nearly 78%) (Table 2). This reflects the broader situation in Burundi, a predominantly rural country where 85.7% of the population are farmers with limited formal education [20]. A significant number of traditional practitioners (37.5%) also engage in farming, highlighting the deep integration of traditional medicine within rural communities. The knowledge of traditional practices is primarily passed down through family inheritance (89.1%), a trend similar to that observed, e.g., in Uganda [16], Togo [33], Indonesia [34], Portugal [35], or Ecuador [36], which reflects the strong cultural roots of traditional medicine. However, the advanced age of Burundian practitioners, coupled with limited interest among younger generations who are increasingly drawn to modern medicine, constitutes a real risk of losing this traditional knowledge [37–40]. Similar concerns have been raised in other African countries, e.g., in the Democratic Republic of the Congo [41, 42] or Morocco [43], where traditional medicine is still largely dominated by older individuals whose experience and reputation play a key role [40]. The low education level of Burundian practitioners mirrors that reported in Ethiopia [44], Togo [45], Nigeria [46], Algeria [47], and Pakistan [48]. In contrast, countries such as Ghana [49], China [50], and Uganda [37] report higher levels of education among traditional practitioners, facilitating the formalization and documentation of their practices. With respect to gender, the male-to-female ratio in Burundi shows a slight predominance of women, which is consistent with findings from Morocco [51–53], Uganda [37], South Africa [54], Mauritius [55], and Mexico [56]. This differs from other contexts, such as Nigeria [57, 58], Ghana [49], Algeria [34], DRC [41, 42], Kenya [59], and China [50], where men dominate the field.

Table 2
Sociodemographic and professional profiles of traditional practitioners treating symptoms of type 2 diabetes in Burundi

Variables	**Category**	**Number of respondents**	**%**
Gender	Man	30	46.9
	Women	34	53.1
Age	≤ 30	13	20.3
	31–40	5	7.8
	41–50	12	18.8
	51–59	12	18.8
	≥ 60	22	34.4
Marital status	Married	55	85.9
	Bachelor	3	4.7
	Widow/widower	4	6.3
	Divorce	2	3.1
Level of education	None	31	48.4
	Primary	19	29.7
	Secondary	13	20.3
	University	1	1.6
Main occupations	Traditional practitioner	37	57.8
	Traditional practitioner and farmer	24	37.5
	Traditional practitioner and trader	1	1.6
	Traditional practitioner and electrician	1	1.6
	Traditional Practitioners and Priests	1	1.6
Origin of knowledge	Family heritage	57	89.1
	Personal experience	2	3.1
	Revelation	2	3.1
	Personal and academic experience	1	1.6
	Trained by other traditional practitioners	1	1.6

Variables	Category	Number of respondents	%
	Family heritage and revelation	1	1.6
Experience in the profession	≤ 30	38	59.4
	31–40	12	18.8
	41–50	10	15.6
	51–59	2	3.1
	≥ 60	2	3.1

Signs and symptoms of type 2 diabetes identified by Burundian traditional practitioners

Traditional practitioners identified a total of 30 signs and symptoms associated with type 2 diabetes (Fig. 2). The most frequently mentioned symptoms were polydipsia (13), polyuria (9), and edema (6). These findings are in line with the diagnostic criteria established by the World Health Organization [60]. It is evident that Burundian traditional practitioners possess keen observational skills for symptoms well documented for their association with hyperglycaemia. This suggests that there could be a solid foundation for integrated collaboration between traditional and alternative medicines. Similar findings have been reported in other regions, such as Togo [45], Kenya [61], Uganda [37], Cameroon [62], South Africa [63], Mauritius [55], Tanzania [64], and China [65], where traditional practitioners have shown the capacity to recognize and interpret key symptoms of diabetes. While some studies have documented a diagnostic approach involving the observation of insects gathering around a patient's urine [45, 66], none of the practitioners interviewed in this study reported using such a method. Notably, a significant number of traditional practitioners (23.4%) reported relying on laboratory test results to confirm a type 2 diabetes diagnosis before initiating treatment. This reliance on biomedical confirmation has also been observed in China [50], Kenya [61], and Uganda [37], further supporting the credibility of traditional practitioners and their potential for collaboration with modern healthcare systems.

Medicinal plants recommended by Burundian traditional practitioners for the treatment of symptoms of type 2 diabetes

A total of 121 plant species belonging to 111 genera and 51 botanical families were identified as being used in the traditional treatment of symptoms of type 2 diabetes (Fig. 3 & Table 3 Supplementary file 2). These species represent approximately 3% of the estimated regional flora, which comprises approximately 3,881 species distributed among 185 families (Table 4 Supplementary file 3). Notably, this estimate, compiled from floristic data reported by Ntore et al.[24], likely underrepresents the true plant diversity of the region. Nevertheless, the use of these species in the treatment of diabetes has been documented (Fig. 3 & Table 3 Supplementary file 2) underscore both the remarkable floristic richness of the country and the depth of indigenous ethnopharmacological practices. Among these families, Asteraceae (14.87%) clearly dominated with 18 species, followed by Fabaceae (13.22%) with 16 species. Additionally, Rubiaceae, Lamiaceae and Acanthaceae, with five species, Anacardiaceae and Euphorbiaceae, are each represented by four species. The prominence of Asteraceae is expected, as this family is widely distributed in Burundi's flora [21], particularly in savannahs and disturbed habitats where pioneer species are prevalent. Numerous studies have confirmed the importance of Asteraceae in the treatment of diabetes both in vitro and in vivo [67]. The prominent role of these plant families in the Burundian pharmacopoeia highlights a strong connection between the ecological availability of plant species and their medicinal use, illustrating the ecological rationale underlying local ethnobotanical practices. These findings align with global ethnobotanical studies where Asteraceae, Fabaceae, and Rubiaceae are also frequently cited for their therapeutic uses. For example, in Morocco, five species of Asteraceae are used for diabetes [68]; a similar count has been reported in Algeria [69]. In Uganda, 13 species of Asteraceae are recognized for their antidiabetic properties [70], and in China, this family includes 20 species [50], reflecting the international recognition of this family in the treatment of diabetes. The results obtained locally therefore confirm a global trend linking floristic diversity to medicinal use and position Burundi in a dynamic of ethnobotanical convergence with other countries.

Frequency of citation, relative frequency of citation and level of fidelity of medicinal plant species against type 2 diabetes in Burundi

The most frequently cited species used in the traditional treatment of type 2 diabetes include *Gymnanthemum amygdalinum* (Delile) Sch.Bip. ex Walp. (FC: 17%, RFC: 0.27%, FL: 26.56%), *Dicoma anomala* Sond. (FC: 14%, RFC: 0.22%, FL: 21.9%), *Erythrina abyssinica* Lam. ex DC. (FC: 13%, RFC: 0.20%, FL: 18.8%), *Parinari curatellifolia* Planch. ex Benth. (FC: 12%, RFC: 0.19%, FL: 18.8%), and *Ageratum conyzoides* L. (FC: 11%, RFC: 0.17%, FL: 17.2%) (Table 3 Supplementary file 2). Importantly, these quantitative indices primarily reflect cultural salience, shared empirical experience, and interinformant agreement rather than direct evidence of therapeutic efficacy. Their high citation frequency suggests their widespread use and potential therapeutic value in managing type 2 diabetes. Among these, *G. amygdalinum* stands out for having the highest FC, RFC, and FL values. Interestingly, ethnobotanical prominence is partially supported by pharmacological studies conducted elsewhere, which report that methanolic extracts and ethyl acetate fractions of *G. amygdalinum* flowers exhibit strong α-glucosidase inhibitory activity, attributed to two key flavonoids, luteolin and 3-O-methylquercetin [71]. Similarly, the frequent use of *D. anomala* and *A. conyzoides* reflects their significant role in traditional antidiabetic practices. *P. curatellifolia* and *E. abyssinica* also likely present notable pharmacological potential. Leaf hydroethanolic extracts of *P. curatellifolia*, which are rich in polyphenols, have shown the ability to inhibit α-amylase, an essential enzyme in carbohydrate metabolism [72]. For *E. abyssinica*, phytochemical analysis of its stem bark revealed 68 flavonoids, 41 of which were found to inhibit, in a dose-dependent manner, Protein Tyrosine Phosphatase 1B (PTP1B), a key enzyme in blood glucose regulation [67, 73]. Overall, the convergence between ethnobotanical consensus and existing phytochemical evidence for several highly cited species supports the relevance of traditional knowledge as a heuristic framework for guiding scientific inquiry. These findings emphasize that the rich diversity of the medicinal flora of Burundi has significant bioactive potential for the traditional management of type 2 diabetes. This flora represents a valuable resource for future phytotherapeutic research and development.

Graphical data preview

In line with the Burundian proverb *"Imiti ikora ikoranye"* ("medicines are more effective when combined"), medicinal plants in Burundi are commonly used in mixtures involving two or more species [31, 32]. This practice was confirmed by the present ethnobotanical survey, where 55 multiherbal recipes and eight monoherbal recipes were documented (Fig. 4 & Table 3 Supplementary file 2). The predominance of multispecies formulations highlights polymedication as a defining characteristic of Burundian traditional medical practice, particularly in the management of chronic or complex symptomatology. The use of plant combinations is a common feature of traditional medical systems worldwide and is often interpreted as an empirical strategy aimed at enhancing perceived therapeutic efficacy, broadening the spectrum of action, or mitigating undesirable effects [10, 74]. In Burundi, this reliance on multiherbal formulations has previously been documented in the treatment of infectious diseases [31, 32], suggesting a coherent therapeutic logic that transcends specific disease categories. Similar patterns have been reported in neighboring Rwanda, where combinations of medicinal plants are commonly employed in the management of liver-related disorders [30], as well as in other African and Asian traditional medical systems [75, 76].

Interaction network based on Cytoscape_v3.10.2 (https://cytoscape.org); organic layout. Recipes are represented by circles, medicinal plants by diamonds, the size of the diamond is proportional to the frequency of citation of each species while the colors of the diamonds correspond to the botanical family of the plant.

Parts used and biological types of medicinal plants against type 2 diabetes in Burundi

In traditional medicine, the choice of plant organs for therapeutic use is closely linked to culturally transmitted knowledge regarding their perceived efficacy, availability, and safety. In the present study, leaves were the most frequently used plant part (52.4%), followed by bark (27.0%) (Fig. 5). The predominance of leaves can be explained by several factors, including their ease of access, nondestructive harvesting, and well-documented richness in bioactive secondary metabolites such as flavonoids, alkaloids, and phenolic compounds, which are often associated with their antidiabetic activity [77]. Similar patterns have been reported in ethnobotanical surveys focused on diabetes management in Nigeria [58], Morocco [53], Uganda [37], and Southwest Pakistan [66], suggesting convergent selection of leaves across different cultural and ecological contexts. This convergence may reflect both empirical therapeutic effectiveness and long-term experimentation within traditional medical systems. Furthermore, leaf harvesting is generally regarded as more sustainable than the collection of bark or roots, as it minimizes damage to individual plants and reduces the risk of population decline [40]. This practice contributes to biodiversity conservation, particularly in regions where medicinal plants are heavily relied upon, provided that the harvesting intensity remains within sustainable limits [40, 78]. In contrast, the relatively high use of bark observed in this study may raise conservation concerns, as repeated debarking can compromise plant survival, highlighting the need for awareness and management strategies within local ethnomedical practices. With respect to biological life forms, phanerophytes were the most represented (52.9%), followed by hemicryptophytes (22.3%), therophytes (16.5%), and chamaephytes (7.4%) (Fig. 6). The dominance of phanerophytes in the medicinal flora is a common feature in ethnobotanical studies and can be attributed to their structural diversity and perennial availability of exploitable organs such as leaves, bark, and roots. In the context of Burundi's diverse agroecological zones, woody species remain accessible throughout the year, which likely reinforces their prominence in traditional pharmacopoeias. Comparable results have been documented in ethnobotanical investigations conducted in forested and semiforested regions of Nigeria [46, 58], where phanerophytes constitute the majority of medicinal species.

Methods of preparing and administering recipes

The majority of traditional practitioners interviewed in this study prepared their antidiabetic remedies through decoction (65.6%), followed by maceration (31.3%) and aqueous infusion (3.1%). These remedies are derived either from a single plant (mono-recipes) or from combinations of multiple species (multirecipes); such combinations were reported by our informants as *"not random"* but embedded within a therapeutic logic; indeed, plants are often believed to act synergistically to increase their efficacy, broaden their therapeutic coverage, or mitigate potential adverse effects [8, 9]. These preparation methods are both simple and practical and use locally available resources, such as water and firewood. The oral route is predominantly used for administration (97.6%), with dosages typically given either as half a cup of tea (approximately 125 mL; used by 60.9% of practitioners) or a spoonful (approximately 15 mL, 3 times a day; 39.1%). The consistent use of traditional measuring tools such as spoons and cups demonstrates a structured empirical approach and an evident effort to standardize treatments. The duration of treatment varies from 4 days to 3 months, with patients often continuing therapy until noticeable improvement is observed. However, this relatively short duration contrasts with practices in other African regions. For example, treatment periods in South Africa can range from 6–12 months [79], whereas in Morocco, they may last anywhere from 3 weeks to 4 years [43]. Although type 2 diabetes is generally not curable, the relatively short duration of treatment indicates that these treatments are probably only applied during exacerbation episodes. It would be interesting to evaluate whether chronic traditional treatments could be beneficial in sustaining controlled glycemia and avoiding such exacerbations.

Despite these regional differences, the preference for decoction remains a consistent trend across numerous African studies on medicinal plants used in diabetes treatment [41, 52, 58, 80]. Additionally, the use of plant powders or the incorporation of medicinal plants into food, such as fruits or vegetables, reported in this study aligns with practices documented in West Africa [81, 82]. These findings position Burundian traditional practices within a broader regional framework characterized by a rich pharmacopoeia rooted in empirical knowledge. However, this knowledge would greatly benefit from further scientific validation, harmonization, and integration into primary healthcare to enhance the management of type 2 diabetes.

Conclusion

This ethnobotanical study involving 64 traditional practitioners across Burundi documents a rich and coherent body of indigenous knowledge related to the management of symptoms locally associated with type 2 diabetes. A total of 121 medicinal plant species belonging to 111 genera and 51 botanical families were recorded, reflecting both the floristic diversity of the country and the depth of culturally embedded therapeutic practices. The predominance of families such as Asteraceae, Fabaceae, Rubiaceae, Lamiaceae, Acanthaceae, Anacardiaceae, and Euphorbiaceae highlights the strong relationships among plant availability, ecological distribution, and medicinal use within Burundian traditional medical systems. Among the documented species, *Gymnanthemum amygdalinum* (Del.) Sch.Bip. ex Walp. emerged as particularly prominent, with the highest **relative frequency of citations (0.27%)** and **fidelity level (26.6%)**. Although these quantitative indicators might point to *the* central cultural importance of *G. amygdalinum* within the local pharmacopoeia rather than to therapeutic efficacy, available pharmacological data indicate a clear rationale for its use.

The widespread use of multispecies formulations (87.3%) further reflects a culturally rooted practice of polymedication, emphasizing synergistic plant interactions as a defining feature of local traditional healing strategies. Leaves were the most frequently used plant part (52.4%), a pattern likely driven by considerations of accessibility, sustainability, and perceived efficacy, whereas the dominance of **phanerophytes (52.9%)** and **hemicryptophytes (22.3%)** underscores the importance of woody and perennial species in sustaining traditional medicinal practices throughout the year. The preparation and administration methods were remarkably consistent, with decoction (65.6%) and oral **(97.6%)** intake overwhelmingly preferred, illustrating a shared empirical framework and some degree of standardization within traditional practice. Importantly, traditional practitioners have demonstrated a strong ability to recognize symptom patterns consistent with type 2 diabetes, often integrating biological diagnostic information, which suggests existing complementarities between traditional and contemporary health systems. Although not providing clinical validation, this study offers a comprehensive ethnobotanical baseline that preserves and contextualizes traditional knowledge that is at risk of erosion. The documented species and practices constitute a valuable foundation for future interdisciplinary research, including phytochemical, pharmacological, and sustainability studies, guided by ethnobotanical relevance. Given the chronic nature of type 2 diabetes, future investigations may also explore whether certain traditional treatments, when used over extended periods, contribute to maintaining glycemic balance and reducing symptom exacerbations. Ultimately, such research could support the culturally appropriate development of affordable, locally sourced phytotherapeutic resources while contributing to the recognition, conservation, and responsible integration of indigenous medical knowledge within broader healthcare frameworks.

Abbreviations

UB: University of Burundi, IDF: International Diabetes Federation, **Traditional Medicine (TM),** RGPAE: Recensement Générale de la Population, de l'Habitat, d'Agriculture et de l'Elévage, MEAE: Ministère de l'Environnement de l'Agriculture et de l'Elévage, frequency of citation (FC), relative frequency of citation (RFC), level fidelity (FL), Np (number of informants), N (total number of informants), WHO: **World Health Organization**, *G. amygdalinum*, *A. conyzoides*, *P. curatellifolia*, *E. abyssinica*, MOR (monorecette, R: recipe, NC: Not collected, T2 D: type 2 diabetes, APG: Angiosperm Phylogeny Group, PTP1B: Protein Tyrosine Phosphatase 1B

Declarations

Ethics approval and consent to participate: The study protocol was developed in accordance with the *ethical principles for medical research involving human subjects* adopted by the Declaration of Helsinki, article 24 [23]. Each respondent had received explanation about the objectives of the study and was free to participate to the survey. During data collection, an effort was verbally made to encourage participants by explaining that their cooperation is of benefit to the country and that the disclosure of their medicinal plant knowledge would not interfere with the continued practice of their art. Plant material was collected under the guidance of one of the community leaders, ensuring that the biodiversity rights of the indigenous people were protected as data were acquired under the *Nagoya Protocol* (N/Réf: 710.06/046/DG1.0/OBPE/2025) and Ethical approval for the study was granted by the East African Nutrition Science Institute Institutional Ethics Committee (EANSI/Ethics/2024-001).

Availability of data and materials: All the data are presented in the manuscript.

Competing interests: The authors declare that they have no competing interests.

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Autors' contributions: Anatole Bukuru: prepared the study, conducted field surveys, obtained and analyzed the survey data, wrote the article ; Jérémie Ngezahayo : supervised the study and revised the article ; Fréderic Nsabiyumva: supervised the study and revised the article ; Emmanuel Banzubaze : supervised the study and revised the article ; Pierre Duez: supervised the study and revised the article ; Jacques Nkengurutse : supervised the study, revised the analysis of survey and botanical data and approved the article.

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Figures

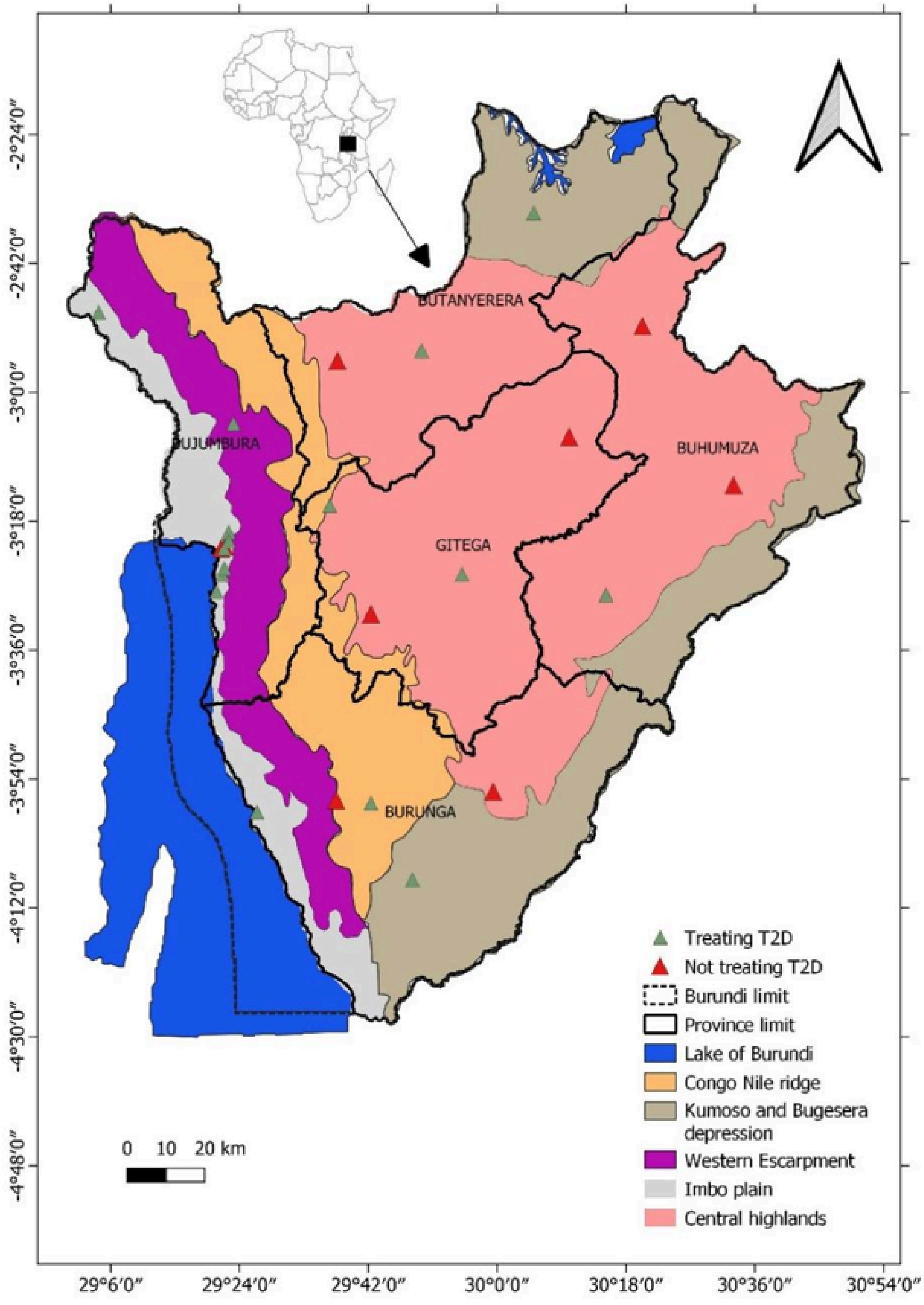

Figure 1

Location of antidiabetic plant survey market sites in the five agroecological regions of Burundi

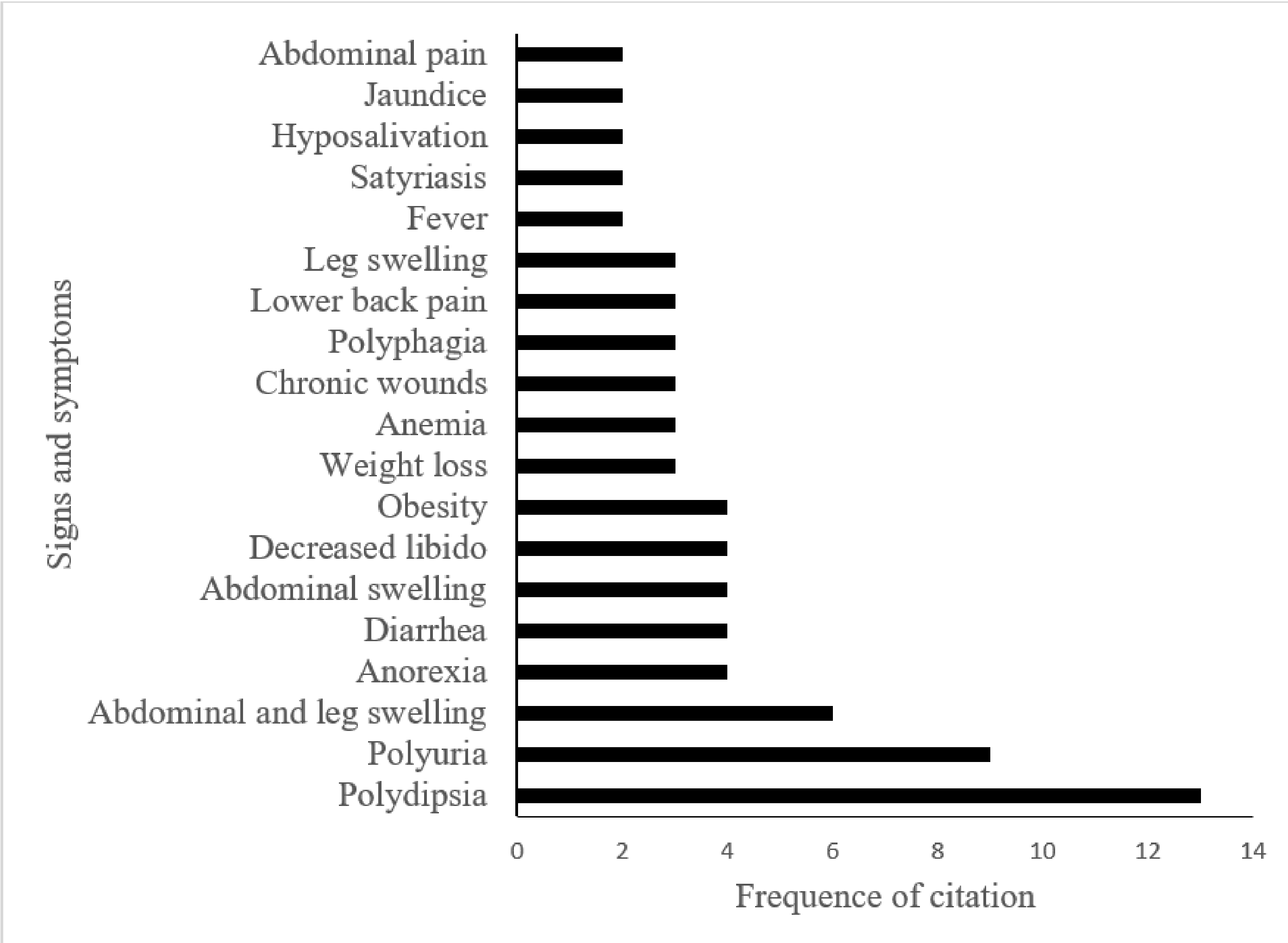

Figure 2

Main signs and symptoms of type 2 diabetes recognized by Burundian traditional practitioners

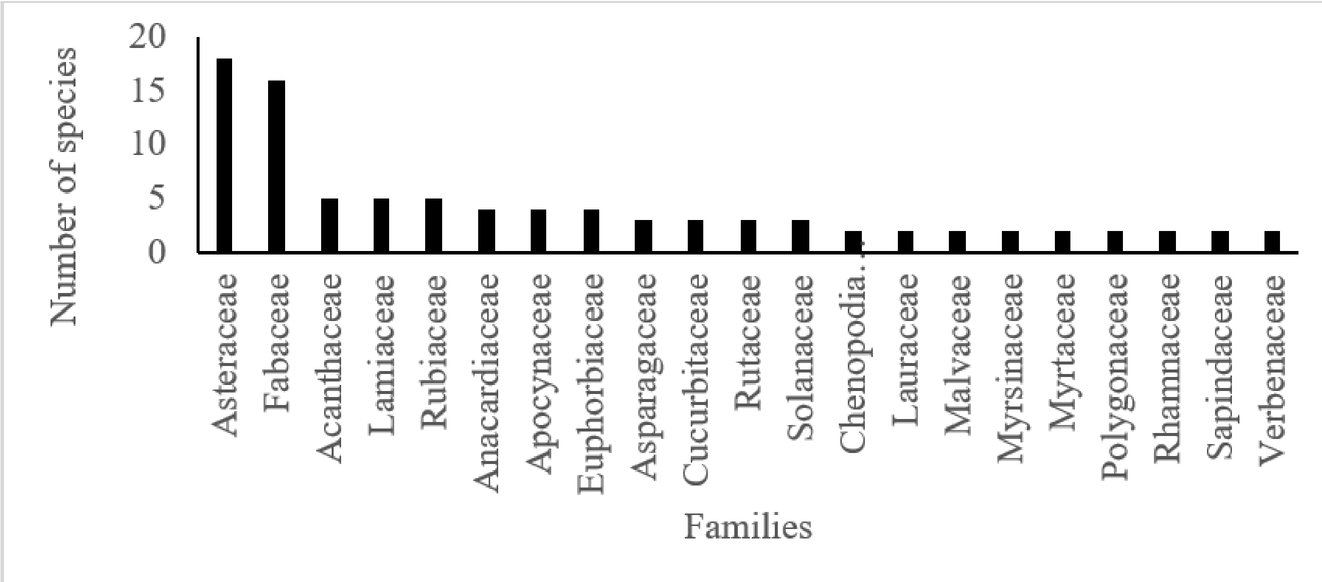

Figure 3

Main families of medicinal plants used for symptomatology recognized as type 2 diabetes in Burundi

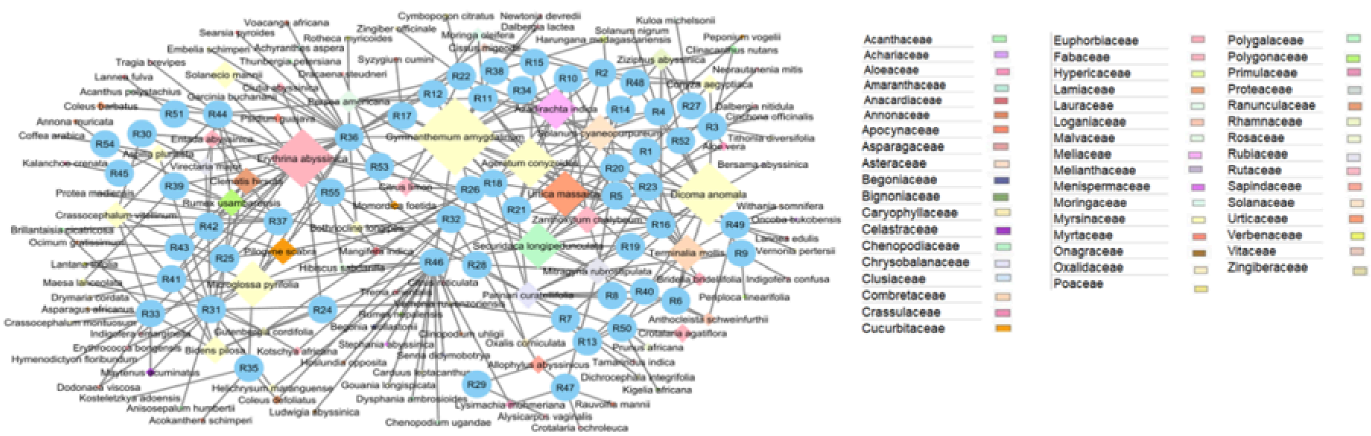

Figure 4

Relationships between recipes and medicinal for managing type 2 diabetes symptoms in Burundi.

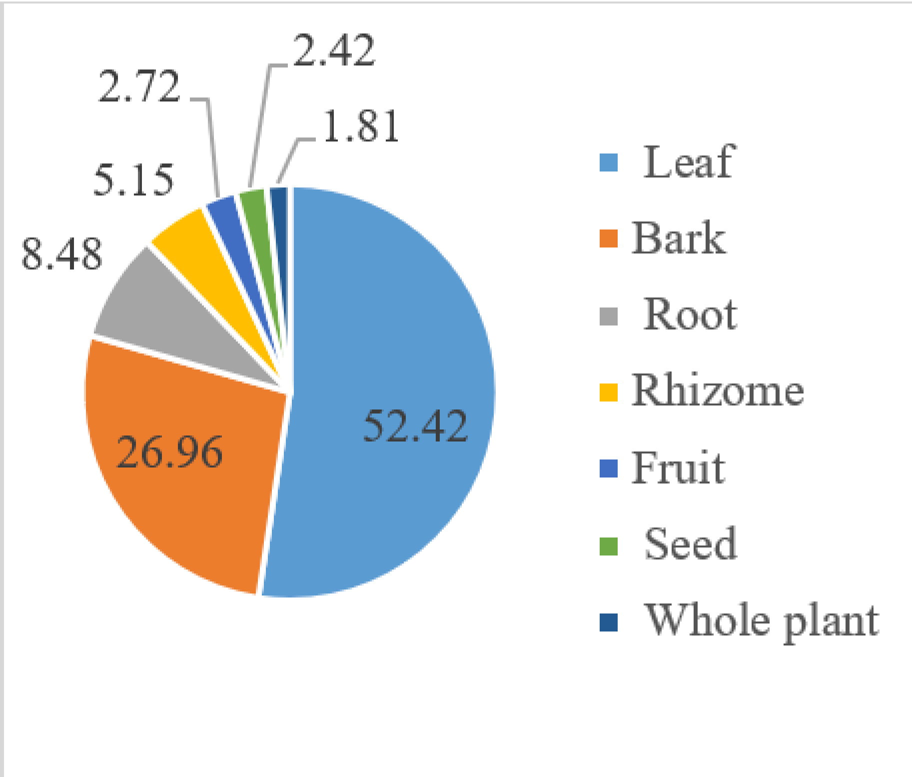

Figure 5

Parts of the plant used type 2 diabetes in Burundi

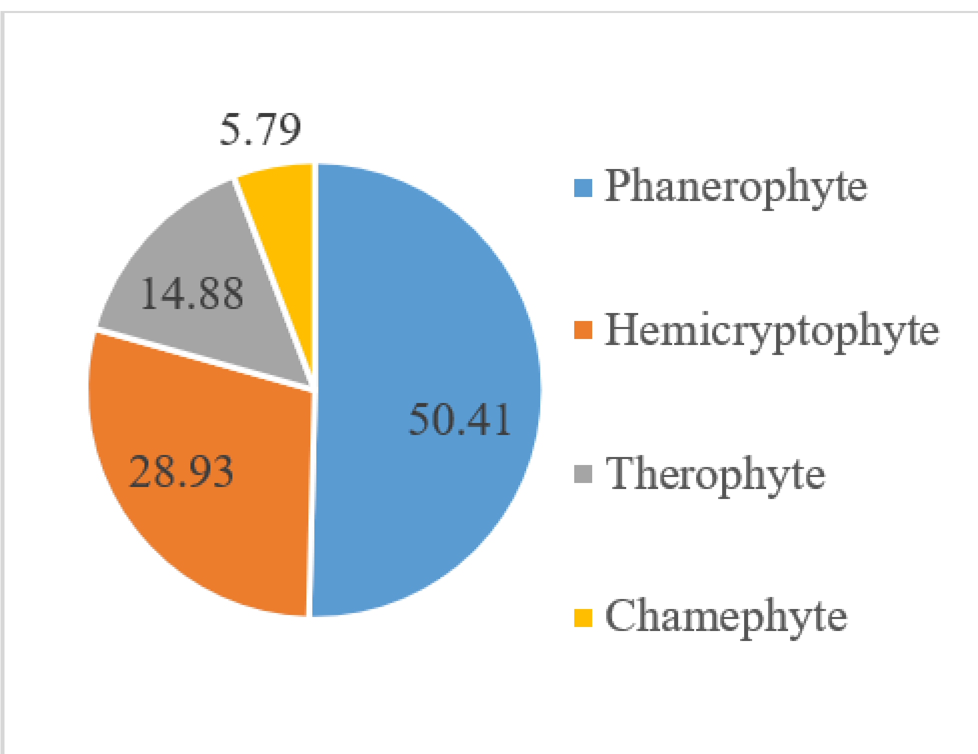

Figure 6

Biological types of plants used for treatment of type 2 diabetes in Burundi

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