Traditional medicinal plant knowledge for cardiovascular diseases in Ngazidja, Comoros: diversity, cultural importance and patterns of consensus

Ali Ahmed, Fenitriniaina Judith Elyna Mahitasoa, Zoarilala Rinah Razafindrakoto, Sandratriniaina Marie Victoire, Hamidou Soulé, Mohamed Said Hassane, Ahamadi Oili Daroussi, Ammena Y. Binsaleh, Mohamed Andilyat, David Ramanitrahasimbola, Nantenaina Tombozara

Correspondence

Ali Ahmed[1], Fenitriniaina Judith Elyna Mahitasoa[2], Zoarilala Rinah Razafindrakoto[2,3], Sandratriniaina Marie Victoire[2], Hamidou Soulé[1], Mohamed Said Hassane[1], Ahamadi Oili Daroussi[4], Ammena Y. Binsaleh[5], Mohamed Andilyat[4], David Ramanitrahasimbola[2,3], Nantenaina Tombozara[2,3*]

[1]Laboratoire Aliment, Réactivité, Synthèse des Substances Naturelles (LAR2SN), Faculté des Sciences, Université des Comores, PO Box 2585, Route de la Corniche, Moroni - Union des Comores.
[2]Institut Malgache de Recherches Appliquées, PO Box 3833 Avarabohitra Itaosy, Antananarivo, Madagascar.
[3]Mention Pharmacie, Faculté de Médecine, Université d'Antananarivo, Madagascar.
[4]Herbier National Laboratoire de Biodiversité et Ecosystème, Faculté des Sciences et Techniques, Université de Comores, PO Box 2585, Route de la Corniche, Moroni - Union des Comores.
[5]Department of Pharmacy Practice, College of Pharmacy, Princess Nourah bint Abdulrahman University, P.O. Box 84428, Riyadh 11671, Saudi Arabia.

*Corresponding Author: nzara89@gmail.com

Ethnobotany Research and Applications 36:29 (2026) - http://dx.doi.org/10.32859/era.36.29.1-33
Manuscript received: 14/09/2026 - Revised manuscript received:03/11/2026 – Published 04/11/2026

Research

Abstract

Background: Cardiovascular diseases (CVD) represent a growing public health challenge in the Union of the Comoros, where traditional medicine remains an integral component of local healthcare practices due to socio-economic and cultural factors. This study aimed to document and characterise the plants used by Comorian people in Ngazidja island for CVD and their relative symptom management.

Methods: An ethnomedicinal survey was conducted among 571 consenting informants, from March to July 2019 across 19 districts of Ngazidja Island, using a semi-structured interview. Data on plant species, plant parts used, preparation methods, administration modes and relative CVD treated as well as their symptoms were recorded. Ethnobotanical indices including frequency of citation (FC), use value (UV), relative frequency of citation (RFC), fidelity level (FL), family use value (FUV), and informant consensus factor (ICF) were used to characterise the patterns of traditional plant use and identify species of particular cultural importance.

Results: 79 species belonging to 66 genera and 42 families were inventoried. Asteraceae was the most represented family, while Moringaceae showed the highest FUV. Most of the species (62.03%) were wild harvested. Herbs (40.51%) predominated, and leaves (57.47%) were the most commonly used plant parts. Decoction (73.40%) and oral administration (86.87%) were the preferred preparation and administration methods. *Moringa oleifera* (UV = 0.165 and FL for HTA = 75%) and *Allium sativum* (UV = 0.121 and FL for HTA = 100%) were identified as the most important species, recognized for their antihypertensive and cardioprotective properties. High ICF values across CVD categories indicated considerable convergence among informants regarding the plants used for these diseases. *Diospyros comorensis* and *Phyllanthus comorensis*, two endemic species, represent the priorities for further investigation.

Conclusions: These findings document the diversity and convergence of the medicinal plants used for CVD in Ngazidja and provide a basis for prioritizing endemic species for future phytochemical, pharmacological, and clinical investigations.

Keywords: Cardiovascular diseases, Comoros, Ethnomedicinal study, Field survey, Medicinal plants, Ngazidja island

Background

Cardiovascular diseases (CVD) are one of the main causes of mortality worldwide, estimated at approximately 19.2 million deaths annually that represent one of the major contributors to non-communicable disease global burden (Sulola *et al.* 2025). CVD impacts are particularly critical in developing countries where prevention and management remain insufficient (Masenga & Kirabo 2023). Main CVD include arterial hypertension (HTA), atherosclerosis (ATS), cardiac arrhythmia (CA), cerebrovascular accidents (CVA), venous thrombosis (VT) and heart failure (HF) that are chronic diseases characterized by vascular dysfunction and progressive arterial damage (Huang *et al.* 2025). Historically, CVD were associated with developed countries but a trend in the epidemiological distribution, that shifted considerably, was observed over the past three decades. Currently, more than three-quarters of CVD-related deaths occur in developing countries, reflecting rapid demographic and lifestyle transitions (Joseph *et al.* 2025). This shift shows the inequality in access to prevention, diagnosis, and treatment. This increased risk of HTA, obesity and metabolic disorders could be attributed to the urbanization, highly processed and energy-rich diets, and reduced physical activity (Mensah *et al.* 2023; Sulola *et al.* 2025). These changes are increasingly observed in African countries, particularly in underdeveloped regions, undergoing rapid socio-economic transitions (Oguta *et al.* 2025).

The Union of the Comoros is not immune to this public health challenge. Despite its population density with a limited epidemiological surveillance capacity, available data indicate that CVD account for approximately 19% of all deaths in the archipelago (World Heart Federation 2024). At the same time, the prevalence of major cardiovascular risk remains substantial within the Comorian population. According to the World Health Organization (WHO 2025), approximately 28% of adults aged 30-79 years had hypertension in 2024, while the prevalence of obesity among adults aged 18 years and older was estimated at 16 % in 2022. These determinants are further exacerbated by socio-economic constraints and limited public health interventions. Moreover, structural constraints within the national health system continue to hinder effective management of chronic diseases. Limited healthcare infrastructure, insufficient availability of specialized care, and the high cost of long-term pharmacological treatments reduce the access to CVD conventional treatments for the majority of the population (Abeid 2026). Therefore, several CVD patients still rely on alternative therapies including the use of medicinal plants to manage chronic disorders.

Hence, traditional medicine becomes a crucial component of healthcare practices in Comoros Islands. Due to chronic disease care costs and the ease of medicinal plants accessibility, where this knowledge is often transferred within families by word of mouth and risks to be lost over time, Comorian people strongly rely on traditional medicine (Soidrou *et al.* 2014). Similar ethnobotanical studies conducted in different geographical and cultural contexts have demonstrated the diversity of traditional plant knowledge and the importance of recording local practices (Çakılcıoğlu 2020; Khatun *et al.* 2012; Korkmaz et al. 2016). These studies illustrate the diversity of traditional plant knowledge and the importance of documenting local practices across different cultural and ecological contexts**.**

CVD are well-known among Comorians and are often diagnosed with symptoms, such as *roho yendao biyo* (palpitations), *lefu* (chest oppression), or general blood flow disorders like headache, eye floaters, dizziness, and vertigo. Therefore, local communities benefiting from the archipelago's botanical richness and traditional knowledge to manage these disease symptoms. Medicinal plants used in these traditional therapies constitute a valuable source of bioactive compounds with pharmacological relevance that can be systematically assessed for their therapeutic potential and their contribution to drug discovery (Abou *et al.* 2022; Razafindrakoto *et al.* 2026; Tombozara *et al.* 2024; Saive *et al.* 2020).

Despite the exceptional plant biodiversity of the Comorian archipelago and the continued reliance of its population on plant-based remedies, scientific documentation of traditional medicinal practices for CVD in Ngazidja remains limited. This includes their distribution according to the disease categories and plant taxa, as well as their preparation methods, in order to determine the species that can be prioritised for future investigation. This lack of ethnomedicinal data is one of the significant gaps that this current study is addressing. Therefore, this study aims to establish a database based on Comorian knowledge of plant species traditionally used for CVD management and contributes to the preservation of indigenous knowledge and provides a scientific basis for future phytochemical, pharmacological, and clinical investigations of cardioprotective natural products.

Materials and Methods

Study area and Socio-Ecological Context

The ethnopharmacological survey was conducted in Ngazidja Island (11°20′-11°50′ S; 43°10′-43°30′ E) from March to July 2019. The Island is located between Mozambique and Madagascar in the Northern of Mozambique channel. The Union of the Comoros had an estimated population of approximately 800 000 inhabitants in 2017, of whom about 50% lived on Ngazidja Island (INSEED 2018). The field surveys were undertaken in 19 districts distributed from the northern, passing the central, to the southern regions of the Island as highlighted in Figure 1. Ngazidja people have a complex historical and cultural background shaped by Bantu, Shirazi, Malagasy, and European influences. Shingazidja, a Swahili-derived dialect incorporating lexical elements from Arabic, French, Portuguese, and Malagasy, constitutes the principal language used for the intergenerational transmission of ethnomedicinal knowledge. Islamic religion predominates and plays an important role in social organization and cultural norms. However, religious practices coexist with local belief systems and customary approaches to health management, including the use of traditional herbal remedies. Ngazidja Island is characterized by a volcanic landscape of two major mountains including the Mount of Karthala (2,361 m) in the south-central region and La Grille (1,087 m) in the northern part of the island. These mountainous areas constitute key reservoirs of biodiversity, including approximately 8,658 ha of natural forest, about 18 ha of mangroves, and nearly 350 ha of reforested area (Allaoui 2011). Two main tropical seasons are observed in this island including a hot and rainy austral summer and a relatively fresh and dried austral winter. Altitudinal gradients and exposure to prevailing winds generate pronounced microclimatic variability, which supports diverse ecological niches and contributes to the availability of a wide range of plant species used in traditional medicine by local communities.

Data Collection

Data were collected through semi-structured interviews designed to obtain both socio-demographic characteristics of the participants and detailed ethnomedicinal information on plant species regarding the vernacular names, the plant parts used, the preparation methods, the routes of administration, and the specific CVD concerns treated. Whenever possible, additional therapeutic uses of the recorded plant species were also documented to provide a broader ethnomedicinal context. Adult volunteers with demonstrable experience and familiarity with local plant nomenclature, ecological habitats, and therapeutic applications were recruited for interview. Particular emphasis was placed on traditional healers and herbalists possessing more specialized knowledge related to the management of CVD. Only participants who provided their consent after understanding the objectives and the intended use of the results of this study were included. Evasive, incomprehensible, or incomplete answers were excluded from the analysis. Interviews were conducted in the local language (Shingazidja) to facilitate effective communication and ensure the accuracy and reliability of the documentation of traditional knowledge. The protocol was approved by the National Ethic Committee for Life and Health Sciences of the University of the Comoros (n° 007/CEA/FST/2019).

Plant Collection and Identification

Cited plant species were collected with the assistance of local informants to ensure accurate correspondence between vernacular names and botanical taxa. Voucher specimens were prepared according to the standard herbarium procedures. Then, the taxonomic identification was carried out by Mrs. Mohamed Andilyat, Director of the National Herbarium of the Comoros, and Mr. Ahamadi Oili Daroussi from the University of the Comoros, by comparing with the reference collections at the National Herbarium of the Comoros. All voucher specimens were deposited at the National Herbarium of the Comoros and assigned unique numbers based on the site and period of collection. The identified species are presented in alphabetical order according to their botanical names.

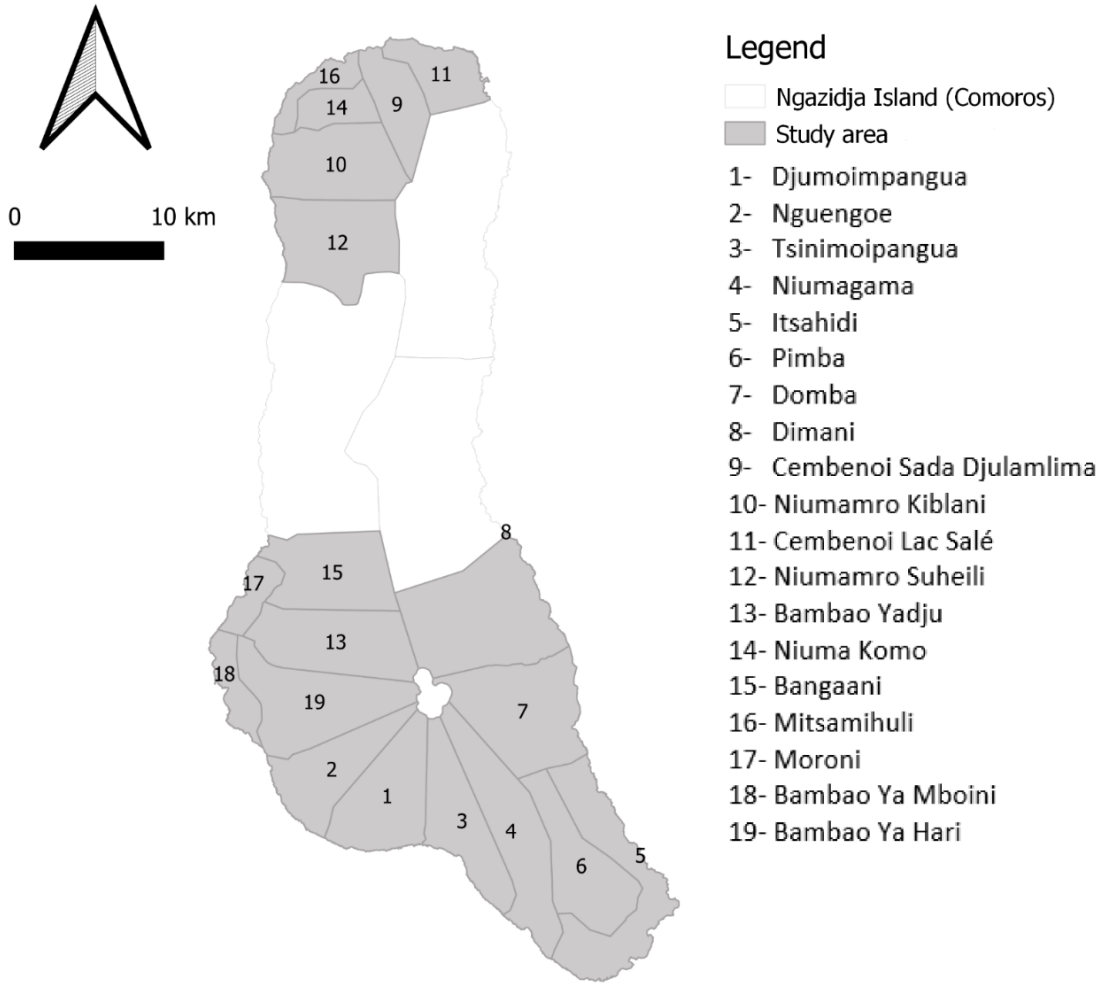


Figure 1. Study area, the nineteen visited Districts in Ngazidja island

Data analysis

Frequencies and rates (%) of socio-demographic characteristics of the respondents were analysed using descriptive statistics. The ethnobotanical importance of the recorded species was evaluated using several quantitative indices, including Frequency of Citation (FC), Use Value (UV), Relative Frequency of Citation (RFC), Fidelity Level (FL), Family Use Value (FUV), and Informant Consensus Factor (ICF).

The Frequency of Citation (FC) and Relative Frequency of Citation (RFC) were calculated to estimate the relative cultural importance of each species.

FC represents the percentage of citations attributed to a given species (N_S) relative to the total number of citations (N_t) according to Equation 1:

$$FC\ (\%) = (N_S \times 100) / N_t \quad (1)$$

While, RFC was calculated as the ratio between the number of informants mentioning a given species (N_{IS}) and the total number of informants participating (N_{TI}) in the survey following the Equation 2 by Tardío & Pardo-de-Santayana (2008):

$$RFC\ (\%) = (N_{IS} \times 100) / N_{TI} \quad (2)$$

The Use Value (UV), which reflects the relative importance of a plant species based on the number of uses reported by informants, was calculated according to the Equation 3 proposed by Phillips *et al.* (1994):

$$UV = \Sigma U / n \quad (3)$$

where U represents the number of use reports per species and n is the total number of informants interviewed.

To assess the relative importance of plant families, the Family Use Value (FUV) was calculated following the Equation 4 proposed by Hoffman & Gallaher (2007):

$$FUV = \Sigma UV_S / n_S \quad (4)$$

where ΣUV_s is the sum of the use values for all species within a family, and n_s is the total number of species in that family.

Fidelity Level (FL) and Informant Consensus Factor (ICF) were used to estimate the agreement level among informants concerning the use of plant species for each disease category. FL is the number of the informants claiming the use of a given species for the same therapeutic purpose, according to the Equation 5 (Amujoyegbe *et al.* 2016):

$$FL (\%) = (N_P \times 100) / N \quad (5)$$

where N_p represents the number of informants citing the use of a species for a particular disease, and N is the number of respondents who cited the species for any use. Beside CVD categories, FL for other diseases including asthma and diabetes were also evaluated.

The ICF was used to measure the degree of homogeneity of knowledge among informants for specific ailment categories, following the Equation 6 proposed by Trotter & Logan (1986):

$$ICF = (N_{ur} - N_t) / (N_{ur} - 1) \quad (6)$$

where N_{ur} is the number of use reports for a specific illness category and N_t is the number of distinct species used for that category. ICF values range from 0 to 1, with values closer to 1 indicating a higher level of consensus among informants.

Statistical relationships between socio-demographic variables and the distribution of medicinal plant knowledge were analysed using IBM SPSS Statistics (20.0).

Results

Sociodemographic characteristics of the respondents

The sociodemographic features of the respondents were reported in Table 1. Among 580 recruited adults, nine (1.55%) were excluded due to their incoherence and inconsistent answers. A total of 571 consenting informants participated in the ethnobotanical survey, 56.04% of whom were females. The included respondents reported 1052 distinct medicinal use reports; 393 of these were cited by both male and female informants, giving 856 reports from males and 589 from females (1445 when counted by gender). The distribution of respondents' knowledge of medicinal plants is illustrated in Figure 2. Figure 3 shows the distribution of plant knowledge across age categories, with respondents older than 50 years accounting for the largest share of use reports (43.67%), followed by participants aged 40-50 years (32.73%) and those aged 30-40 years (14.19%). This age distribution is particularly relevant to show the correlation between respondent knowledge of medicinal plants with the respondents' age. The chi-square test shows a significant difference in the distribution of respondent knowledge of medicinal plants to the increase of age groups ($\chi^2(3) = 174.67$, $p < 0.001$). Concerning the educational level, respondent majority are illiterate and had only Koranic education (50.61%) and those receiving primary education level represent 20.84%. With respect to the respondent occupations, farmers were the most represented (28.37%). Agricultural communities are closer to plants and often use traditional medicine as primary or complementary healthcare systems, particularly in rural areas where access to modern medical services is limited. Household and workers (other occupations) accounted, respectively, for 23.12% and 8.76% of respondents, showing the socio-professional diversity in the Island. Traditional healers represented 9.11% of the respondents. They are generally associated with specific family lineages specialized in medicinal knowledge that is transmitted across generations. Herbal sellers accounted for 17.34% of respondents. They are mainly involved in the commercialization of medicinal plants but not typically recognized as holders of specialized ethnobotanical knowledge. The rates of plant knowledge across occupational activities of respondents are presented in Figure 4. Respondents whose occupation frequently interacts with plant resources generally exhibited greater ethnobotanical knowledge. Most of the respondents were able to name at least one CVD symptom or the CVD itself demonstrating the relevance of the informant selection criteria. Their descriptions allow to classify six common CVD in this study, including HTA, ATS, HF, VT, CA, and CVA as reported in Table 1. Among these diseases, HTA (79.86%) and CVA (57.44%) were the most cited. These findings suggest that HTA and CVA represent the major public health concerns within the

Comorian people that could potentially be associated with lifestyle factors such as dietary habits, psychosocial stress, and limited access to conventional healthcare services.

Table 1. Demographic feature of informants and uses of herbal medicine

Gender	**Frequency**	**Rate (%)**
Male	251	43.96
Female	320	56.04
Age	**Frequency**	**Rate (%)**
20 - 30	71	12.43
30 - 40	90	15.76
40 - 5**0**	137	23.99
> 5**0**	273	47.81
Level of education	**Frequency**	**Rate (%)**
Illiterate	289	50.61
Primary	119	20.84
Secondary	87	15.24
Tertiary	76	13.31
Occupation	**Frequency**	**Rate (%)**
Traditional healer	52	9.11
Farmer	162	28.37
Herbal seller	99	17.34
Student	76	13.31
Worker	50	8.76
Household	132	23.12
Knowledge of CVD	**Frequency**	**Rate (%)**
Hypertension	456	79.86
Atherosclerosis	115	20.14
Heart failure	98	17.16
Cardiac arrhythmia	84	14.71
Venous thrombosis	46	8.06
Cerebrovascular accident	328	57.44
Therapy	**Frequency**	**Rate (%)**
Herbal drugs	324	56.74
Conventional drugs	76	13.31
Combination*	171	29.95

* Combination of herbal and conventional drugs during the treatment

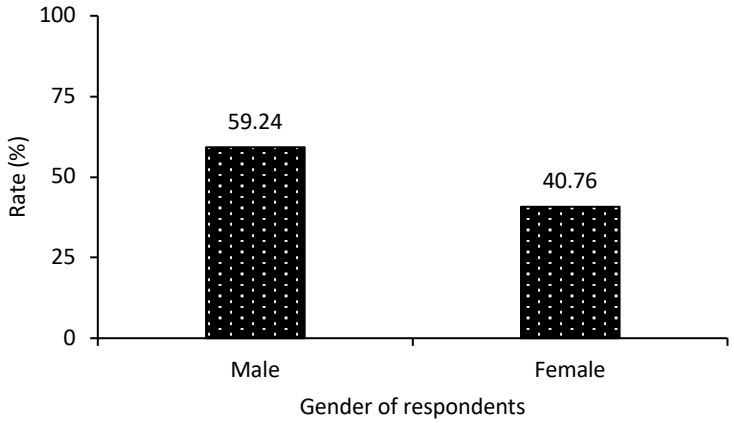


Figure 2. Source of the plant knowledge according to the gender of the respondents (values are relative to the total number of the use reports, N = 1445)

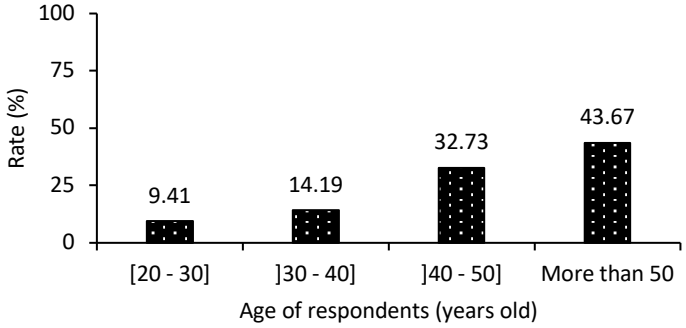


Figure 3. Source of the plant knowledge according to the age of the respondents (values are relative to the total number of the use reports, N = 1445; $\chi^2 = 174.67$; df = 3; $p < 0.001$)

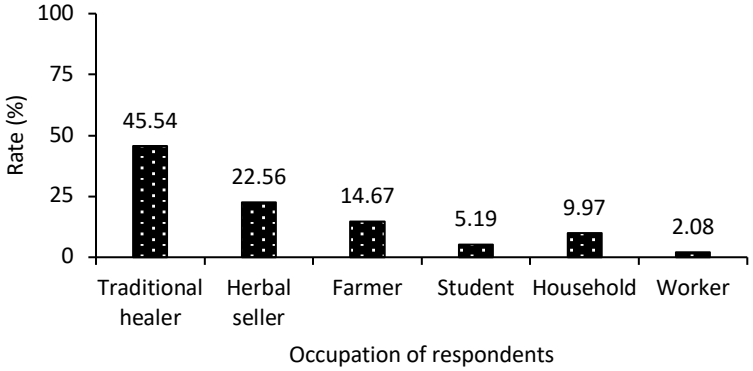


Figure 4. Source of the plant knowledge according to the occupation of the respondents (values are relative to the total number of the use reports, N = 1445)

Ethnomedicinal plant species

During this study, 79 plant species belonging to 66 genera and 42 botanical families were recognised to be traditionally used for CVD management and their relative symptoms. These species are arranged alphabetically according to their botanical name in Table 2 along with their botanical families, local names, plant source, plant parts used, preparation methods, administration modes, treatment duration, and targeted CVD. The diversity of the recorded taxa highlights the richness of local ethnobotanical knowledge and the continued reliance of communities on plant-based therapies. Asteraceae was the most represented family accounting for 8.86% of the registered taxa, followed by Fabaceae (7.59%), then Euphorbiaceae and Piperaceae (each representing 5.06% of the species) as shown in Figure 5. Agricultural status of the recorded medicinal plants is shown in Figure 6, exclusive wild harvesting predominates at 63.29%, while only 5.063% of the species were found in both cultivated and wild environments. The predominance of wild-collected species presents a potential vulnerability to overexploitation and environmental pressures, which may threaten their long-term sustainability. Plant life form distribution is highlighted in Figure 7 where herbs predominate (40.51%), followed by trees (24.05%), shrubs (24.05%), and lianas (11.39%).

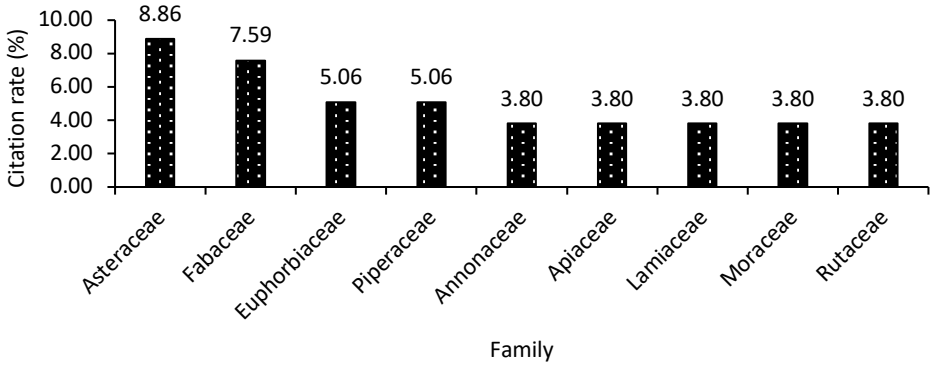


Figure 5. Most used botanical family in the management of CVDs

The distribution of the plant parts used for CVD management is highlighted in Figure 8. Leaves were the most used (57.47%), followed by aerial parts (12.77%). Several preparation methods used by respondents were reported in Figure 9. The decoction method is the most frequently used (73.40%) followed by direct application of raw materials (8.51%) and infusion (7.45%). The administration route distribution is highlighted in Figure 10, where the majority of preparations were taken orally (86.87 %), reflecting a common trend in traditional medicine where systemic pathologies like CVD are primarily treated through the digestive administration. Topic application (11.11%) is generally used for localized symptoms or to alleviate certain symptoms. In contrast, inhalation (2.02 %) is the ideal route to benefit from the therapeutic properties of the volatile compounds.

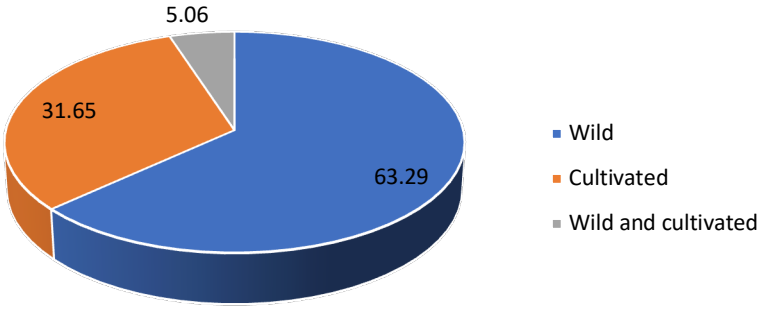


Figure 6. Percentage of the cited plant sources in the management of CVD (values are relative to the total number of the cited plant species, N = 79)

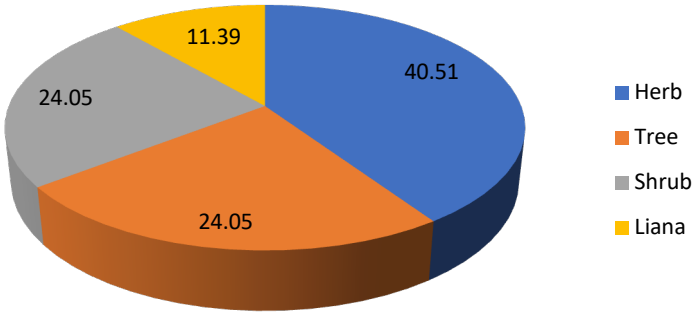


Figure 7. Morphological types of the cited plant species used to manage CVD (values are relative to the total number of the cited plant species, N = 79)

Named CVD with their cited relative symptoms reported by respondents, along with their citation frequencies, are summarized in Table 3. HTA is the most well-known CVD among traditional users, with 56.97% of all citations, followed by CVA (15.79%) and HF (12.95%). ATS, CA, and VT are less-known with respective citations of 7.86%, 3.25% and 3.17%. Headache (18.49%) was the most reported symptom for HTA followed by palpitation (11.37%), vertigo (7.71%), phosphene (6.61%), and epistaxis (5.24%). Usually, recognition of these symptoms could be transmitted by other members of its own family, or by neighbours, or by previous medical consultations, or by the person's own experience. Similar remarks were observed for the reported symptoms of CVA and HF, such as the weakness on one side of the body (5.35%), the difficulty speaking or understanding what others are saying (4.87%), the vision trouble (3.39%), and the breath shortness (4.72%).

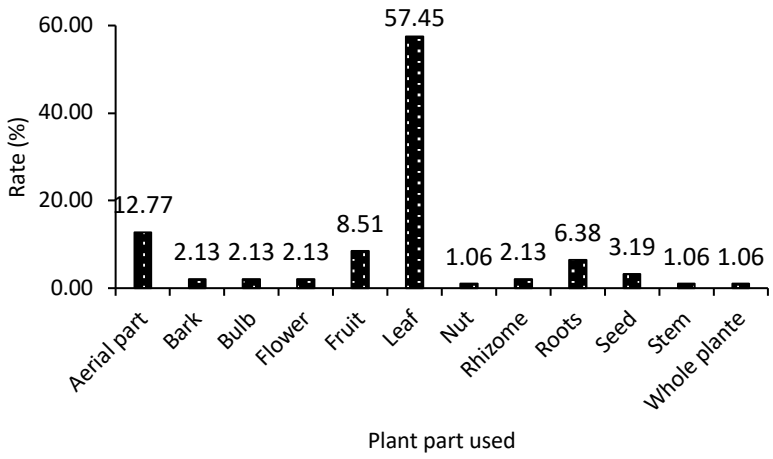


Figure 8. Percentage of used plant parts in the management of CVD

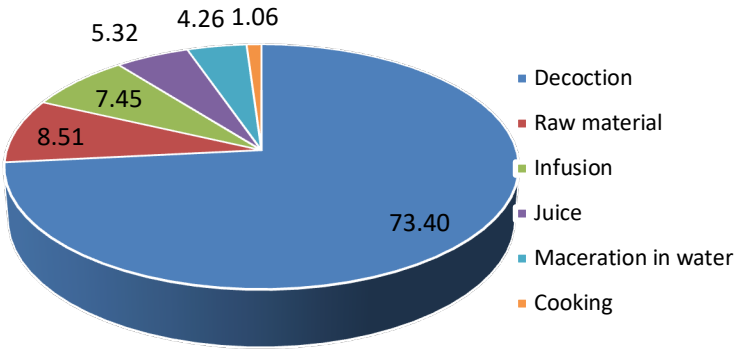


Figure 9. Preparation modes of the herbal medicine (%) in the management of CVD

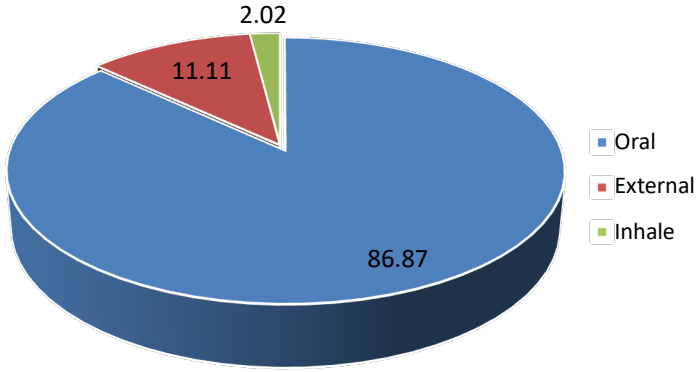


Figure 10. Distribution of the administration modes of herbal medicine (%) in the management of CVD

Table 2. Traditional uses of cited plant species used in the management of CVDs in Ngazidja (Grande Comore)

Botanical name, Family (Voucher number)	Local name(s)	Plant source	Life form	Plant part used	Preparation mode	Administration mode	Treatment duration	Targeted disease
Adansonia digitata L., Malvaceae (NGC-11/2019)	Mbuwu	Wild	Tree	Leaf	Decoction	Drink one cup of tea a day	Until the symptoms disappear	HTA, HF
Ageratum conyzoides L., Asteraceae (NGC-17/2019)	Mnunka	Wild	Herb	Aerial parts	Decoction	Drink one cup of tea a day	According to the patient's clinical condition	HTA, CA
Allium cepa L., Amaryllidaceae (NGC-72/2019)	Itrungu bassoira	Cultivated	Herb	Bulb	Juice	Drink one spoon gathered with one spoon of honey each morning and afternoon	One week	HF
Allium sativum L., Amaryllidaceae (NGC-52/2019)	Itrungu thioumu	Cultivated	Herb	Bulb	Raw materials	Eat three bulbs a day	Until the symptoms disappear	HTA
Aloe vera Burm.f., Asphodelaceae (NGC-54/2019)	Kognonde	Wild	Herb	Leaf	Raw materials	Massage with one leaf twice a day	One week	ATS
					Maceration in water	One spoon a day	One week	HTA, VT
Anacardium occidentale L., Anacardiaceae (NGC-44/2019)	Mkoroshe, Mbibo	Wild	Tree	Leaf	Decoction	Drink one cup of coffee a day	Until the symptoms disappear	HTA, diabetes
				Bark	Infusion			
Ananas comosus (L.) Merr., Bromeliaceae (NGC-24/2019)	Mnanasi	Cultivated	Herb	Fruit	Raw materials	Eat one fruit a day	One week	ATS
Anethum graveolens L., Apiaceae (NGC-39/2019)	Nkuruda	Cultivated	Herb	Aerial parts	Decoction	Drink one cup of coffee a week	According to the patient's clinical condition	HF, asthma
Annona muricata L., Annonaceae (NGC-29/2019)	Mkonoko ziba	Wild and cultivated	Tree	Leaf	Infusion	Drink one cup of coffee each three days	Until the symptoms disappear	HTA, HF, ATS
Annona reticulata L., Annonaceae (NGC-26/2019)	Konoko sefa	Wild and cultivated	Tree	Leaf	Decoction	Drink one cup of tea each morning	One month	HTA, ATS

Annona squamosa L., Annonaceae (NGC-32/2019)	Mkonokono mtsanga	Wild and cultivated	Tree	Leaf	Decoction	Drink one cup of coffee each three days	Until the symptoms disappear	HTA, diabetes
Aphloia theiformis (Vahl) Benn., Aphloiaceae (NGC-33/2019)	Mfarambo	Wild	Shrub	Leaf	Decoction	Drink one cup of tea each morning	One month	HTA, ATS, asthma
Artocarpus altilis (Parkinson) Fosberg, Moraceae (NGC-13/2019)	Mfuriapa	Cultivated	Tree	Leaf	Decoction	Drink one cup of tea each morning	According to the patient's clinical condition	HF, asthma
Artocarpus heterophyllus Lam., Moraceae (NGC-22/2019)	Mfenessi	Cultivated	Tree	Leaf	Decoction	Drink one cup of tea each morning	Three days	HTA
Asystasia gangetica (L.) T. Anderson, Acanthaceae (NGC-53/2019)	Wsite	Wild	Herb	Aerial parts	Decoction	Drink one cup of tea each morning	Until the symptoms disappear	HTA
Azadirachta indica A. Juss., Meliaceae (NGC-23/2019)	Neem	Wild	Tree	Leaf	Decoction	Drink one cup of tea each morning	One month	ATS, CVA, asthma
Bidens pilosa L., Asteraceae (NGC-73/2019)	Ntsohowo	Wild	Herb	Leaf	Decoction	Drink one cup of tea each morning	Three days	HTA
Cajanus cajan (L.) Millsp., Fabaceae (NGC-69/2019)	Mtsuzi	Cultivated	Shrub	Leaf	Decoction	Drink one cup of coffee a day	One to three months	HTA, diabetes
Carica papaya L., Caricaceae (NGC-45/2019)	Mpoipoiyi	Cultivated	Tree	Leaf	Decoction	Drink one cup of tea each morning	Three days	HF
Centella asiatica (L.) Urb., Apiaceae (NGC-09/2019)	Centellas	Wild	Herb	Whole plant	Decoction	Drink one cup of tea each morning	One month	HF
Cinnamomum verum J. Presl., Lauraceae (NGC-19/2019)	Mdarassini	Wild	Tree	Leaf	Decoction	Drink one cup of tea each morning	Until the symptoms disappear	HF, asthma
Citrus aurantiifolia (Christm.) Swingle, Rutaceae (NGC-15/2019)	Mvuraba	Cultivated	Shrub	Fruit	Infusion	Drink one cup of tea each morning	One month	ATS
Citrus limon (L.) Osbeck, Rutaceae (NGC-36/2019)	Mvuraba	Cultivated	Shrub	Leaf	Decoction	Drink one cup of coffee a day	Until the maximal loss of weight	HTA, CVA, diabetes
				Fruit	Juice	Drink one spoon twice a day	One month	
Clematis simensis Fresen., Ranunculaceae (NGC-60/2019)	Igacheu	Wild	Herb	Leaf	Decoction	Drink one cup of tea a day	One month	HTA

Coleus amboinicus (Lour.) Spreng., Lamiaceae (NGC-66/2019)	Gnadombwe ya msiru	Wild	Herb	Aerial parts	Decoction	Drink one cup of tea each morning	Three days	HTA
Coleus scutellarioides (L.) Benth., Lamiaceae (NGC-21/2019)	Gnadombwe	Wild and cultivated	Herb	Aerial parts	Decoction	Drink one cup of tea each morning following a massage at the hand-feet swelling level	Until the symptoms disappear	HF
Combretum coccineum (Sonn.) Lam., Combretaceae (NGC-77/2019)	Mlazi	Wild	Liana	Leaf	Decoction	Drink one cup of tea each two days	Four days	CA, HF
				Root				CA
Cucurbita moschata Duchesne, Cucurbitaceae (NGC-47/2019)	Trango madji	Cultivated	Herb	Leaf	Decoction	Drink one cup of tea each morning	Three days	HTA
Curcuma longa L., Zingiberaceae (NGC-46/2019)	Dzindzanu	Cultivated	Herb	Rhizome	Maceration in water	Drink one spoon a day	Until the symptoms disappear	CVA, HF, asthma
Datura metel L., Solanaceae (NGC-49/2019)	Ilali	Wild	Herb	Flower	Raw materials	Burn and inhale (four to five flowers a day)	Until the symptoms disappear	CA, HF, asthma
					Decoction	Drink one cup of tea each morning		
Diospyros comorensis Hiern, Ebenaceae (NGC-68/2019)	Mgno	Wild	Tree	Leaf	Decoction	Drink one cup of tea each morning	Until the symptoms disappear	HF, HTA, ATS, CVA, asthma
Dodonaea viscosa Jacq., Sapindaceae (NGC-55/2019)	Mlazi	Wild	Shrub	Root	Decoction	Drink one cup of coffee each three days	Until the symptoms disappear	HTA, ATS, HF
Drymaria cordata (L.) Willd. ex Schult., Caryophyllaceae (NGC-01/2019)	Namara	Wild	Herb	Aerial parts	Decoction	Steam bath twice week	Two weeks	HF
Elephantopus scaber L., Asteraceae (NGC-05/2019)	Kurueli	Wild	Herb	Aerial parts	Decoction	Drink one cup of coffee a day	45 days	HF
Euphorbia hirta L., Euphorbiaceae (NGC-16/2019)	Igodziwa	Wild	Herb	Aerial parts	Decoction	Drink one cup of tea each morning	Until the symptoms disappear	HTA, ATS, HF, CVA, Asthma
Ficus lutea Vahl., Moraceae (NGC-20/2019)	Mnamvu	Wild	Tree	Leaf	Decoction	Drink one cup of tea each morning	One month	ATS

Guilandina bonduc L., Fabaceae (NGC-63/2019)	Mtswe	Wild	Shrub	Leaf	Decoction	Drink one cup of tea each morning	Until the symptoms disappear	HTA, ATS
Gymnanthemum coloratum (Willd.) H. Rob. & B. Kahn, Asteraceae (NGC-37/2019)	Mpatakali	Wild	Shrub	Leaf	Decoction	Drink one cup of tea each morning	Three days	HTA
Hedychium coccineum Buch.-Ham. ex Sm., Zingiberaceae (NGC-02/2019)	Singuiziu msiru	Wild	Herb	Root	Infusion	Drink one cup of tea each morning	One month	ATS
Helianthus annuus L., Asteraceae (NGC-41/2019)	Msumu	Cultivated	Herb	Leaf	Decoction	Drink one cup of tea each morning	One month	ATS, HTA
Jatropha confusa Hutch., Euphorbiaceae (NGC-07/2019)	Mkono pembe	Wild	Shrub	Leaf	Decoction	Drink one cup of tea each morning following a massage at the hand-feet swelling level	Until the symptoms disappear	HF
Jatropha curcas L., Euphorbiaceae (NGC-14/2019)	Mri mzungu or Msumu	Wild	Shrub	Seed	Raw material (Cold-pressed vegetable oil)	Massage with the seeds' oil at the hand-feet swelling level	Until the symptoms disappear	HF
				Leaf	Decoction	Drink one cup of coffee a day	One month	Diabetes
Kalanchoe pinnata (Lam.) Pers., Crassulaceae (NGC-31/2019)	Mmamani	Wild	Herb	Leaf	Decoction	Drink one cup of tea each morning	Until the symptoms disappear	HF, ATS
Lactuca indica L., Asteraceae (NGC-48/2019)	Saladi la masera	Wild	Herb	Leaf	Decoction	Drink one cup of tea each morning	Three days	HTA
Lantana camara L., Verbenaceae (NGC-74/2019)	Mnachiba	Wild	Shrub	Aerial parts	Decoction	Drink one cup of coffee a day	One month	HTA, ATS, CVA
Leptadenia lanceolata (Poir.) Goyder *subsp. lanceolata*, Apocynaceae (NGC-75/2019)	Igwedziwa	Wild	Liana	Leaf	Decoction	Drink one cup of tea each morning	One month	HTA, ATS
Leptadenia madagascariensis Decne., Apocynaceae (NGC-65/2019)	Gwe dziwa	Wild	Liana	Leaf	Decoction	Two cups of tea each three days	Two weeks	HTA
Leucocasia gigantea (Blume) Hook. f., Araceae (NGC-76/2019)	Wombo	Wild	Herb	Leaf	Cooking	Eaten with limon juice once a week	One month	VT

Mangifera indica L., Anacardiaceae (NGC-50/2019)	Miembe	Cultivated	Tree	Leaf	Decoction	One spoon a day	Until the symptoms disappear	HF
Microglossa pyrifolia (Lam.) Kuntze., Asteraceae (NGC-51/2019)	Monomle	Wild	Shrub	Leaf	Maceration in water	Two cups of tea each three days	Two weeks	CA
Microsorum scolopendria (Burm. f.) Copel, Polypodiaceae (NGC-58/2019)	Fugere	Wild	Herb	Leaf	Decoction	Drink one cup of tea each morning following a massage at the hand-feet swelling level	Until the symptoms disappear	HF
Momordica charantia L., Cucurbitaceae (NGC-59/2019)	Margozi	Wild	Liana	Aerial parts	Decoction	Drink one cup of coffee a day	One month	HTA, HF, VT, Diabetes
				Fruit	Juice	Drink the juice from one fruit a day	One month	HTA, ATS, CVA, Diabetes
Moringa oleifera Lam., Moringaceae (NGC-61/2019)	Mwendje	Cultivated	Tree	Seed	Decoction	Drink one cup of coffee a day	One week	HTA, ATS, CVA, diabetes
				Leaf				
Musa x paradisiaca L., Musaceae (NGC-42/2019)	Trindi la paka	Cultivated	Herb	Leaf	Decoction	Drink one cup of coffee a day	Two weeks	VT
Myristica fragrans Houtt., Myristicaceae (NGC-71/2019)	Nkugumanga	Cultivated	Tree	Nut	Infusion	Drink one cup of coffee a day	Until the symptoms disappear	HTA, HF, ATS, CVA
Nigella sativa L., Ranunculaceae (NGC-04/2019)	Zilezidou	Cultivated	Herb	Seed	Maceration in water	Apply poultice at the hand-feet swelling level	Until the symptoms disappear	HTA
Ocimum gratissimum L., Lamiaceae (NGC-64/2019)	Rule	Wild	Herb	Leaf	Decoction	Drink one cup of tea each three days	One month	VT, CVA
Passiflora edulis Sims, Passifloraceae (NGC-67/2019)	Mirgnadi	Cultivated	Liana	Fruit	Raw materials (Direct consumption)	Eat one fruit each three days	One month	HTA
Persea americana Mill., Lauraceae (NGC-43/2019)	Mbonobo	Cultivated	Tree	Leaf	Infusion	Drink one cup of coffee a day	One week	HTA
					Decoction		Two weeks	ATS, CVA

							Three weeks	VT
Petroselinum crispum (Mill.) Fuss, Apiaceae (NGC-79/2019)	Persil	Cultivated	Herb	Leaf	Decoction	Drink one cup of tea each week	One month	ATS
Phyllanthus comorensis Leandri, Phyllanthaceae (NGC-78/2019)	Mdrunda tsole	Wild	Shrub	Leaf	Decoction	Drink one cup of coffee a day	Until the symptoms disappear	HTA, HF, CVA, Asthma
Piper betle L., Piperaceae (NGC-03/2019)	Rambu msiru	Wild	Liana	Leaf	Decoction	Drink one cup of tea each morning	According to the patient's clinical condition	HTA, VT, CVA
Piper borbonense (Miq.) C.DC., Piperaceae (NGC-12/2019)	Rambu msiru	Wild	Liana	Leaf	Decoction	Drink two cups of tea each three days	Two weeks	HTA, CVA
Piper capense L.f., Piperaceae (NGC-70/2019)	Mdara	Wild	Liana	Fruit	Raw material (Topic application)	Fruits were grinded and applied at the hand-feet swelling	Until the symptoms disappear	HF, CVA
Piper nigrum L., Piperaceae (NGC-18/2019)	Rambu msiru	Cultivated	Liana	Bark	Decoction	Drink one cup of tea each morning	Until the symptoms disappear	CVA, HTA
Coleus scutellarioides (L.) Benth., Lamiaceae (NGC-21/2019)	Gnadombwe	Wild and cultivated	Herb	Aerial parts	Decoction	Drink one cup of tea each morning following a massage at the hand-feet swelling level	Until the symptoms disappear	HF
Psidium guajava L., Myrtaceae (NGC-25/2019)	Mbera	Wild	Shrub	Leaf	Decoction	Drink one cup of tea each morning	Two weeks	HTA
Ricinus communis L., Euphorbiaceae (NGC-28/2019)	Mmona	Wild	Shrub	Leaf	Decoction	Drink one cup of tea each morning following a massage at the hand-feet swelling level	Until the symptoms disappear	HF
Rubus idaeus L., Rosaceae (NGC-30/2019)	Mframboizi	Wild	Herb	Aerial parts	Decoction	One cup of tea each week	One month	ATS
Sabdariffa diversifolia Jacq., Malvaceae (NGC-08/2019)	Issambala	Wild	Shrub	Aerial parts	Decoction	Drink one cup of coffee a day	Until the symptoms disappear	HF
Saccharum officinarum L., Poaceae (NGC-27/2019)	M'moi mkudu	Cultivated	Herb	Stem	Juice	Drink one cup of tea added with juice of one limon a day	Until the symptoms disappear	HF

Senna alata (L.) Roxb., Fabaceae (NGC-56/2019)	Moizindji	Wild	Shrub	Leaf	Decoction	Drink one cup of tea each morning	One week	ATS
Senna occidentalis (L.) Link, Fabaceae (NGC-35/2019)	Sanamaka	Wild	Shrub	Leaf	Decoction	Drink one cup of coffee a day	According to the patient's clinical condition	HF, VT, CVA
				Root				ATS
Senna sophera (L.) Roxb., Fabaceae (NGC-06/2019)	Sanamaka	Wild	Shrub	Root	Infusion	Drink one cup of tea each morning	Until the symptoms disappear	HF
Syzygium aromaticum (L.) Merr. & L. M. Perry, Myrtaceae (NGC-10/2019)	Mkaranfu	Cultivated	Tree	Fruit	Decoction	One spoon a day	Until the symptoms disappear	HTA, HF
Tamarindus indica L., Fabaceae (NGC-34/2019)	Wu hadju wa magobo	Wild	Tree	Leaf	Decoction	Drink one cup of coffee a week	One month	HF
Tambourissa leptophylla (Tul.) A. DC., Monimiaceae (NGC-38/2019)	Mbweza	Wild	Tree	Fruit	Raw material	Fruits were grinded and applied at the hand-feet swelling	Until the symptoms disappear	HF, ATS, CVA
Tristemma mauritianum J.F. Gmel., Melastomataceae (NGC-62/2019)	Trunda dzaha	Wild	Herb	Leaf	Decoction	Drink one cup of coffee a day	Until the symptoms disappear	HF
Zanthoxylum asiaticum (L.) Appelhans, Groppo & J.Wen, Rutaceae (NGC-57/2019)	Mtso	Wild	Shrub	Leaf	Decoction	Drink one cup of tea each morning	Until the symptoms disappear	HF, CVA
				Root				
Zingiber officinale Roscoe, Zingiberaceae (NGC-40/2019)	Singuiziwu	Cultivated	Herb	Rhizome	Juice	One spoon a day	Until the symptoms disappear	HF, VT, CVA, asthma

HTA: Hypertension, ATS: Atherosclerosis, HF: Heart failure, CA: Cardiac arrhythmia, VT: Venous thrombosis, CVA: Cerebrovascular accident

Ethnopharmacological parameters

The quantitative ethnopharmacological indices, including frequency of citation (FC), relative frequency of citation (RFC), use value (UV), and fidelity level (FL) relative to each disease recorded for plant species used in the management of CVD are reported in Table 4. These indices provide complementary insights into the cultural salience, consensus, and therapeutic prominence of medicinal plants within the surveyed community. FC and RFC reflect the degree of recognition among informants, UV captures the diversity of reported uses, and FL indicates the specificity of a species for a particular ailment category. Together, they allow a nuanced interpretation of ethnomedicinal importance beyond simple mention frequency (Hoffman & Gallaher 2007; Tardío & Pardo-de-Santayana 2008). *M. oleifera* emerged as the most prominent taxon, exhibiting the highest FC (8.94%), RFC (9.81%), and UV (0.165). This species covers the management three CVD including HTA with FL of 75%, CVA (14.29%) and ATS (1.79%). The convergence of these indices regarding the medicinal uses of *M. oleifera* suggests widespread recognition and consistent therapeutic application in the management of these CVD. The second most cited species was *Allium sativum* with FC, RFC, UV, and FL values of 6.56%, 6.13%, 0.121, and 100%, respectively, focusing only on the HTA management. Among the cited species, some of them are used for specific treatment with 100% value of FL. Fifteen (15) are specific for HF including *A. cepa, C. papaya, S. sophera, C. asiatica, D. cordata, E. scaber, S. diversifolia, J. confusa, M. indica, M. scolopendria, C. scutellarioides, R. communis, S. officinarum, T. indica*, and *T. mauritianum*. *M. pyrifolia* is used specifically for CA management. Thirteen (13) are specific for HTA management, such as *A. sativum, A. heterophyllus, A. gangetica, B. pilosa, C. simensis, C. amboinicus, C. moschata, G. coloratum*, *L. indica, L. madagascariensis, N. sativa, P. edulis,* and *P. guajava*. Seven (7) are only involved in ATS management, including *A. comosus, S. alata, C. aurantiifolia, F. lutea, H. coccineum, P. crispum*, and *R. idaeus*. *L. gigantea* and *M. paradisiaca* are specifically use for VT treatment. It is noteworthy to mention that no plant species is used specifically to treat CVA. Remarkably, two endemic species also emerge as important species for CVD management in Comoros, including *D. comorensis* and *P. comorensis* with respective FC, RFC and UV of 4.37% and 5.70%, 5.25% and 7.36%, and 0.081 and 0.105. *D. comorensis* is used in the management of CVA, ATS, HTA, and HF with respective FL of 40%, 10%, 6.67%, and 6.67% while *P. comorensis* is used in HTA, CVA, and HF treatments with respective FL of 31.71%, 29.27%, and 7.32% showing that they are multipurpose medicinal plant species in CVD management such as *E. hirta* and *P. americana* (Table 4).

Table 3. Most cited symptoms of CVD by the respondents

Disease	Cited symptoms	Frequency	Rate* (%)	
Hypertension	Headache	501	18.49	56.97
	Tinnitus	69	2.55	
	Phosphene	179	6.61	
	Vertigo	209	7.71	
	Palpitation	308	11.37	
	Asthenia	45	1.66	
	Dyspnoea	78	2.88	
	Epistaxis	142	5.24	
	Haematuria	13	0.48	
Cardiac arrhythmia	Syncope	12	0.44	3.25
	Breath shortness	15	0.55	
	Palpitation	42	1.55	
	Faintness	11	0.41	
	Chest engine	8	0.30	
Heart failure	Chronic lack of energy	122	4.50	12.95
	Feet and legs swelling	101	3.73	
	Breath shortness	128	4.72	
Venous thrombosis	Hot skin and sensitivity	38	1.40	3.17
	Feet and legs swelling	48	1.77	
Cerebrovascular accident	Weakness on one side of the body	145	5.35	15.79
	Numbness or tingling in the face in the arms or legs	59	2.18	
	Vision trouble	92	3.39	
	Difficulty speaking or understanding what others are saying	132	4.87	
Atherosclerosis	Pain at the legs level	72	2.66	7.86
	Heart attack	61	2.25	
	Poor wound healing	80	2.95	
Total citation		2,710	100	

*: Relative to the total citation of the symptoms

Family Use Value (FUV) with the number of species belonging to each family were reported in Table 5. Higher FUV reveals the relative importance of plant species family regarding the respondents' use reports. Moringaceae showed the highest FUV (0.165) represented only by *M. oleifera*, followed by Phyllanthaceae (0.105), represented only by *P. comorensis*, and Myristicaceae (0.102), represented by *M. fragrans*. These family could be considered as the most important among those reported by the respondents. In contrast, Asteraceae, Fabaceae, Euphorbiaceae, and Piperaceae with respective FUV of 0.011, 0.010, 0.029, and 0.012 (represented respectively by 7, 6, 4, and 4 species) demonstrate the diversity of these plant families**.**

ICF index measures the agreement degree among respondents regarding the use of species to treat a specific disease. The ICF values of each CVD along with those of diabetes and asthma calculated from the use reported by respondents were reported in Table 6. Among CVD, CA (0.93) and HTA (0.92) showed strong convergence in therapeutic practices, suggesting that knowledge related to cardiovascular care is widely shared and consistently applied within the Comorian communities. Besides, high ICF values for CVA (0.89), VT (0.81), HF (0.72), and ATS (0.69) further illustrate the homogeneity and stability of this knowledge system across different CVD, reflecting structured patterns of plant selection rather than random or highly individualized selections.

Table 4. Ethnopharmacological parameters for the data analysis

Botanical name	FC (%)	RFC (%)	UV	FL (%)							
				HTA	CA	HF	VT	CVA	ATS	Asthma	Diabetes
Adansonia digitata	0.48	0.70	0.009	25	-	75	-	-	-	-	-
Ageratum conyzoides	1.14	1.75	0.021	20	80	-	-	-	-	-	-
Allium cepa	0.38	0.53	0.007	-	-	100	-	-	-	-	-
Allium sativum	6.56	6.13	0.121	100	-	-	-	-	-	-	-
Aloe vera	1.71	2.63	0.032	53.33	-	-	26.67	-	20	-	-
Anacardium occidentale	0.95	0.88	0.018	80	-	-	-	-	-	-	20
Ananas comosus	0.29	0.35	0.005	-	-	-	-	-	100	-	-
Anethum graveolens	0.67	0.88	0.012	-	-	80	-	-	-	20	-
Annona muricata	3.80	3.50	0.070	60	-	35	-	-	5	-	-
Annona reticulata	0.86	1.05	0.016	50	-	-	-	-	50	-	-
Annona squamosa	0.57	0.88	0.011	80	-	-	-	-	-	-	20
Aphloia theiformis	2.76	3.15	0.051	77.78	-	-	-	-	16.67	5.56	-
Artocarpus altilis	0.57	0.88	0.011	-	-	80	-	-	-	20	-
Artocarpus heterophyllus	0.48	0.70	0.009	100	-	-	-	-	-	-	-
Asystasia gangetica	0.57	0.53	0.011	100	-	-	-	-	-	-	-
Azadirachta indica	1.05	1.58	0.019	-	-	-	-	55.56	33.33	11.11	-
Bidens pilosa	0.38	0.35	0.007	100	-	-	-	-	-	-	-
Cajanus cajan	0.76	0.70	0.014	75	-	-	-	-	-	-	25
Carica papaya	0.38	0.53	0.007	-	-	100	-	-	-	-	-
Centella asiatica	0.57	0.53	0.011	-	-	100	-	-	-	-	-
Cinnamomum verum	0.48	0.53	0.009	-	-	66.67	-	-	-	33.33	-
Citrus aurantiifolia	0.38	0.35	0.007	-	-	-	-	-	100	-	-
Citrus limon	3.04	2.28	0.056	46.15	-	-	-	46.15	-	-	7.69
Clematis simensis	0.67	0.53	0.012	100	-	-	-	-	-	-	-
Coleus amboinicus	0.57	0.35	0.011	100	-	-	-	-	-	-	-
Coleus scutellarioides	0.10	0.18	0.002	-	-	100	-	-	-	-	-
Combretum coccineum	2.28	1.93	0.042	-	90.91	9.09	-	-	-	-	-
Cucurbita moschata	0.38	0.18	0.007	100	-	-	-	-	-	-	-
Curcuma longa	1.90	1.40	0.035	-	-	12.50	-	62.50	-	25	-
Datura metel	3.61	2.63	0.067	-	53.33	6.67	-	-	-	40	-

Diospyros comorensis	4.37	5.25	0.081	6.67	-	6.67	-	40	10	36.67	-
Dodonaea viscosa	1.14	1.40	0.021	75	-	12.50	-	-	12.50	-	-
Drymaria cordata	0.10	0.18	0.002	-	-	100	-	-	-	-	-
Elephantopus scaber	0.10	0.18	0.002	-	-	100	-	-	-	-	-
Euphorbia hirta	5.23	5.25	0.096	53.33	-	6.67	-	20	3.33	16.67	-
Ficus lutea	0.10	0.18	0.002	-	-	-	-	-	100	-	-
Guilandina bonduc	0.57	0.53	0.011	66.67	-	-	-	-	33.33	-	-
Gymnanthemum coloratum	0.76	0.53	0.014	100	-	-	-	-	-	-	-
Hedychium coccineum	0.19	0.18	0.004	-	-	-	-	-	100	-	-
Helianthus annuus	0.76	0.53	0.014	66.67	-	-	-	-	33.33	-	-
Jatropha confusa	0.19	0.18	0.004	-	-	100	-	-	-	-	-
Jatropha curcas	0.76	0.70	0.014	-	-	25	-	-	-	-	75
Kalanchoe pinnata	0.57	0.53	0.011	-	-	66.67	-	-	33.33	-	-
Lactuca indica	0.57	0.35	0.011	100	-	-	-	-	-	-	-
Lantana camara	2.19	2.10	0.040	50	-	-	-	41.67	8.33	-	-
Leptadenia lanceolata	0.38	0.35	0.007	50	-	-	-	-	50	-	-
Leptadenia madagascariensis	0.19	0.18	0.004	100	-	-	-	-	-	-	-
Leucocasia gigantea	0.29	0.18	0.005	-	-	-	100	-	-	-	-
Mangifera indica	0.19	0.18	0.004	-	-	100	-	-	-	-	-
Microglossa pyrifolia	0.29	0.18	0.005	-	100	-	-	-	-	-	-
Microsorum scolopendria	0.10	0.18	0.002	-	-	100	-	-	-	-	-
Momordica charantia	4.94	3.68	0.091	38.10	-	4.76	14.29	4.76	4.76	-	33.33
Moringa oleifera	8.94	9.81	0.165	75	-	-	-	14.29	1.79	-	8.93
Musa x paradisiaca	0.29	0.18	0.005	-	-	-	100	-	-	-	-
Myristica fragrans	5.51	5.43	0.102	48.39	-	16.13	-	25.81	9.68	-	-
Nigella sativa	0.57	0.53	0.011	100	-	-	-	-	-	-	-
Ocimum gratissimum	1.62	1.75	0.030	-	-	-	50	50	-	-	-
Passiflora edulis	0.57	0.35	0.011	100	-	-	-	-	-	-	-
Persea americana	2.47	2.80	0.046	50	-	-	12.50	31.25	6.25	-	-
Petroselinum crispum	0.19	0.18	0.004	-	-	-	-	-	100	-	-
Phyllanthus comorensis	5.70	7.36	0.105	31.71	-	7.32	-	29.27	-	31.71	-
Piper betle	1.14	1.05	0.021	50	-	-	33.33	16.67	-	-	-
Piper borbonense	0.76	0.53	0.014	66.67	-	-	-	33.33	-	-	-

Piper capense	0.29	0.18	0.005	-	-	50	-	50	-	-	-
Piper nigrum	0.48	0.35	0.009	50	-	-	-	50	-	-	-
Psidium guajava	0.48	0.35	0.009	100	-	-	-	-	-	-	-
Ricinus communis	0.19	0.18	0.004	-	-	100	-	-	-	-	-
Rubus idaeus	0.48	0.35	0.009	-	-	-	-	-	100	-	-
Sabdariffa diversifolia	0.29	0.18	0.005	-	-	100	-	-	-	-	-
Saccharum officinarum	0.19	0.18	0.004	-	-	100	-	-	-	-	-
Senna alata	0.10	0.18	0.002	-	-	-	-	-	100	-	-
Senna occidentalis	1.05	0.70	0.019	-	-	25	25	25	25	-	-
Senna sophera	0.38	0.35	0.007	-	-	100	-	-	-	-	-
Syzygium aromaticum	0.67	0.53	0.012	66.67	-	33.33	-	-	-	-	-
Tamarindus indica	0.29	0.18	0.005	-	-	100	-	-	-	-	-
Tambourissa leptophylla	0.57	0.53	0.011	-	-	33.33	-	33.33	33.33	-	-
Tristemma mauritianum	0.19	0.18	0.004	-	-	100	-	-	-	-	-
Zanthoxylum asiaticum	0.86	0.70	0.016	-	-	50	-	50	-	-	-
Zingiber officinale	3.52	3.50	0.065	-	-	10	25	50	-	15	-

FC: Frequency of citation; RFC: Relative frequency of citation; UV: Use value; FL: Fidelity level; HTA: Hypertension; CA: Cardiac arrhythmia; HF: Heart failure; VT: Venous thrombosis; CVA: Cerebrovascular accident; ATS: Atherosclerosis

Table 5. Family use value of the cited species

Family	Family Use Value	Number of species
Acanthaceae	0.011	1
Amaryllidaceae	0.064	2
Anacardiaceae	0.011	2
Annonaceae	0.032	3
Aphloiaceae	0.051	1
Apiaceae	0.009	3
Apocynaceae	0.005	2
Araceae	0.005	1
Asphodelaceae	0.032	1
Asteraceae	0.011	7
Bromeliaceae	0.005	1
Caricaceae	0.007	1
Caryophyllaceae	0.002	1
Combretaceae	0.042	1
Crassulaceae	0.011	1
Cucurbitaceae	0.049	2
Ebenaceae	0.081	1
Euphorbiaceae	0.029	4
Fabaceae	0.010	6
Lamiaceae	0.014	3
Lauraceae	0.027	2
Malvaceae	0.007	2
Melastomataceae	0.004	1
Meliaceae	0.019	1
Monimiaceae	0.011	1
Moraceae	0.007	3
Moringaceae	0.165	1
Musaceae	0.005	1
Myristicaceae	0.102	1
Myrtaceae	0.011	2
Passifloraceae	0.011	1
Phyllanthaceae	0.105	1
Piperaceae	0.012	4
Poaceae	0.004	1
Polypodiaceae	0.002	1
Ranunculaceae	0.011	2
Rosaceae	0.009	1
Rutaceae	0.026	3
Sapindaceae	0.021	1
Solanaceae	0.067	1
Verbenaceae	0.040	1
Zingiberaceae	0.034	3

Table 6. ICF of the mentioned disease categories

Disease category	UR	% UR	NT	% Taxa	ICF
Hypertension	456	43.34	37	46.84	0.92
Cardiac arrhythmia	61	5.80	5	6.33	0.93
Heart failure	128	12.17	37	46.84	0.72
Venous thrombosis	49	4.66	10	12.66	0.81
Cerebrovascular accident	175	16.63	21	26.58	0.89
Atherosclerosis	85	8.08	27	34.18	0.69
Asthma	68	6.46	6	7.59	0.93
Diabetes	30	2.85	6	7.59	0.83
Total	1052	100			

UR: Use report, %UR: percentage of UR, NT: number of taxa, ICF: informant consensus factor

Discussion

Demographic characteristics of the respondents

Ngazidja Island was selected to undertake the survey for its high population density, richness in botanical diversity, and the persistent reliance of local communities on traditional medicinal practices. Female respondent predominance is consistent with several findings reported by previous ethnobotanical studies and shows the importance of women roles in household healthcare and traditional medicinal knowledge preservation (El Moumen *et al.* 2025; Rifat *et al.* 2022; Tombozara *et al.* 2024). While, the lower participation of men may also be related to their frequent absence due to their professional activities mainly outside the household, that could also explain their dominance in plant medicinal knowledge, which is observed in several African communities (Tombozara *et al.* 2024). Older respondents tend to have cumulative experiential knowledge due to their long-standing intergenerational oral transmission of traditional medicinal practices as reported in similar studies (Pereira *et al.* 2016; Tamene *et al.* 2024; Tombozara *et al.* 2024), highlighting concerns about the possibility of losing this ancestral knowledge and the importance of its preservation. In this study as in others, limited formal education does not hinder the retention of traditional knowledge since less educated people often use plant-based remedies and remain closely linked to local cultural traditions (El Moumen *et al.* 2025; Rokaya *et al.* 2014). The proportion of traditional healers is often low in ethnomedicinal studies, but despite their relatively small number, traditional healers play a vital role in preserving ethnomedicinal knowledge (Tombozara *et al.* 2024). Hence, their decline raises concerns regarding the long-term preservation of this cultural heritage. Conversely, the population's reliance on herbal sellers could constitute a potential public health risk due to the absence of standardized dosages and limited diagnostic expertise (El Moumen *et al.* 2025; Rifat *et al.* 2022). HTA and CVA are the most known by Comorian people. It may be due to their high prevalence in several countries in Africa and generate socioeconomic burdens for patients (El Moumen *et al.* 2025; Rifat *et al.* 2022; Rokaya *et al.* 2014). Although medicinal plants are widely used as complementary therapies for CVD, recent literatures emphasize that they should not replace conventional medical treatment but rather be integrated into complementary and evidence-based healthcare approaches (WHO, 2019). Therefore, documenting and scientifically evaluating these plant-based remedies remain essential to ensure their safety, efficacy, and sustainable use.

Ethnomedicinal plant species

Asteraceae and Fabaceae families are predominant within Sub-Saharan African floristic patterns which are similar to those observed in this study that may be explained by the similarities in edaphic and climatic parameters (Cornelius & Van Wyk 2024; Randrianarivony *et al.* 2017). The predominance of wild-collected species exposes them to increased vulnerability to overexploitation and environmental pressures, which may threaten their long-term survival. Similar trends have been reported by recent studies conducted in East Africa and the islands of the western Indian Ocean, where wild plant species constitute a primary source of traditional medicine due to their abundance in nature and the widespread belief among local communities that their therapeutic virtues are stronger than those cultivated plant species (Mangoale & Afolayan 2020; Saive *et al.* 2020). Thus, promoting responsible and sustainable harvesting practices become crucial by implementing various strategies to preserve, in particular, the most used species or those with limited geographical distribution.

Plants in the Asteraceae family are dominated by herbaceous species. Furthermore, the island's tropical climate allows for abundant growth of herbs, which are frequently used due to their accessibility and rapid growth (Rafidison *et al.* 2019). Trees are typically valued for their aerial parts, including stem barks, leaves, fruits or seeds, as their underground parts like roots. They are frequently used in preparations intended for the treatment of chronic diseases such as CVD. Although less common, shrubs and lianas may constitute important sources of traditional medicine due to the presence of bioactive compounds that play key roles in local therapeutic practices. Several studies conducted across tropical regions of Africa showed similar patterns where leaves are the most used plant part used such as in this study (Kariuki 2018; Odukoya *et al.* 2022). It may be due to its ease access and the abundance of this part among the plant. Besides, leaf harvesting shows both ecological and practical implications. Leaves can be harvested without causing significant damage to the plant, making their collection more sustainable compared with harvesting other parts of the plant (Bodeker *et al*. 1997). In contrast, roots or whole plants harvesting can negatively affect plant survival and could be associated with the species declining thereby threatening both biodiversity and knowledge transfer (Kumar 2006; Marappan *et al.* 2025). Fruits are mainly consumed as complementary foods to alleviate symptoms associated with CVD due to the omnipresence of antioxidant compounds such as vitamins that could bring general health benefits (Fakudze *et al*. 2023; Mofokeng *et al.* 2022). Other plant parts, including bulbs, flowers, nuts, rhizomes, seeds, and stem bark, were rarely cited by respondents. This limited use may be due to ecological, practical, and cultural factors. Harvesting these plant parts often requires destructive practices that may compromise plant survival and/or reduce the long-term availability of medicinal resources (Awoke & Tahir 2025).

Regarding preparation methods, water is the most available extraction solvent for empirical preparations. Hot extraction with water method is easy to prepare and widely preferred for the treatment of chronic diseases such as CVD (El Moumen *et al.* 2025). Decoction involves boiling plants in water enhancing thermostable and water-soluble bioactive compounds extraction, such as phenolics, flavonoids, tannins, and glycosides which are recognized to exhibit numerous pharmacological properties essential for CVD management (Jouad *et al.* 2001; Rifat *et al.* 2022). Infusion consists on boiling water, then immersing plant materials in boiled water for 10 to 15 min. This preparation is preferred to avoid the bitter taste of the prepared remedies to improve the taste for a long-term treatment.

Systemic pathologies like CVD are primarily treated via the digestive tract demonstrating the abundance of oral administration route (Odukoya *et al.* 2022) while topical application is generally used for localized symptoms or to alleviate certain symptoms. CVD show several complexes symptoms, where such symptoms as syncope, faintness, and haematuria were common to several diseases other than cited CVD (Bozkurt *et al.* 2021; Brignole 2007; King & Steggall 2014; Iadecola & Gottesman 2019; McDonagh *et al.* 2023; Stadje *et al.* 2016; Tsao *et al.* 2023) and may bring confusion to respondents to cite them. In this case, the risk of confusion is high. The desired effects of a treatment for one CVD may be contraindicated for others, which could lead to a cardiovascular system burden, which is a highly sensitive system, particularly the heart, the circulatory dynamics of the blood and the endothelium. However, high ICF values for each CVD, close to 1, indicate a high degree of convergence among informants regarding the use of a limited number of plant species for particular CVD categories (Trotter & Logan 1986). ICF values then show culturally established patterns of medicinal plant use and may contribute in species prioritisation for further pharmacological investigation.

Comparison with existing pharmacological evidence in the treatment of CVD

In this study, 79 medicinal plant species were reported by 571 respondents to manage CVD. These species could be classified according to their ethnobotanical parameters such UV, FC and FL, and also according to the existing studies that have been undertaken by researchers on the species.

Plant species with consistent pharmacological data

M. oleifera was the most valued species and used to treat preferably HTA (FL = 75%), but also CVA (FL = 14.29%) and ATS (FL = 1.79%). The reported indices for *M. oleifera* are supported by the similarity in its use to manage similar CVD across African and Asian regions (Agoyi *et al.* 2015; Anwar *et al.* 2007; Mwami *et al.* 2024; Popoola & Obembe 2013). This species has shown cardiovascular-related biological effects in experimental research due to the presence of broad variety of bioactive compounds, corroborating their traditional application in the management of CVD. Peptides in *M. oleifera* inhibit angiotensin-converting enzyme (ACE), leading to a decrease in circulating angiotensin II level and also to vasodilatation (Chen *et al.* 2024). Other compounds like isothiocyanates (niazimicin and niazimine), glucosinolates (glucomoringin derivatives), flavonoids and phenolics (quercetin, chlorogenic acid, and kaempferol) which demonstrate vasodilatory, antioxidant and anti-inflammatory activities, and endothelial function-enhancing effects, and may contribute to lower blood pressure (Divya *et al.* 2024, Menichetti *et al.* 2025). Alkaloids, saponins, tannins, and carotenoids have also been identified in *M. oleifera* which are responsible for its hypoglycaemic, hypolipidemic, and cardioprotective properties contributing to the key roles in chronic diseases prevention such as diabetes (Bhattacharya *et al.* 2018, Divya *et al.* 2024).

A. sativum is among the most important in the world given the interest in its use in traditional medicine for CVD, particularly HTA, and other diseases form sub-Saharan Africa to North Africa, passing through Western Europe and Asia to Latina America (Borlinghaus *et al.* 2014, Ried 2020). Similar to *M. oleifera*, bioactive molecules identified in *A. sativum*, mainly organosulfur and phenolic compounds, have evidenced their antihypertensive activity. Allicin, the main active compounds formed from alliin *via* the enzyme alliinase, possesses a vasodilatory effect *via* the stimulation of nitric oxide (NO) production and the ACE inhibition, contributing to the reduction of blood pressure in hypertensive patients (Borlinghaus *et al.* 2014, Ried 2020). Organosulfur compounds, such as diallyl disulfide, diallyl trisulfide, ajoenes, and *S*-allyl cysteine, release hydrogen sulfide, resulting in vasorelaxant effects by improving endothelial function (Shang *et al.* 2019). *S*-allyl cysteine, found notably in aged garlic, is known for its long-lasting antihypertensive effects. Besides, some flavonoids and phenolics, such as quercetin, reduce vascular oxidative stress, contributing to protection against endothelial dysfunction (El-Saber Batiha *et al.* 2020).

Beside them, other species could also be considered as important as they are cited in other studies to manage CVD such as *A. cepa, A. vera, B. pilosa, C. cajan, C. papaya, S. alata, C. asiatica, C. aurantiifolia, E. hirta, H. annuus, J. curcas, L. camara, M. charantia, M. paradisiaca, M. fragrans, N. sativa, O. gratissimum, P. edulis, P. americana, P. nigrum, P. guajava, R. idaeus, S. officinarum, T. indica, and Z. officinale* (Adsersen & Adsersen 1997; Gbolade 2012; Malik *et al.* 2018; Nureye *et al.* 2025).

Isolated from *M. fragrans*, [(1S,2R)-2-(4-allyl2,6-dimethoxyphenoxy)-1-(3,4-dimethoxyphenyl) propan1-ol acetate], a Neolignan, inhibited thrombin and platelet activating factor without affecting platelet damage, while malabaricone C exerted potential anti-hypertensive activity in deoxycorticosterone acetate (DOCA)-salt-induced hypertensive rats by reducing systolic blood pressure, ventricular hypertrophy, and inflammation in the ventricles and aorta, contributing to this species cardioprotective properties (Ha *et al.* 2020). *E. hirta* has demonstrated *in vivo* and *in vitro* antihypertensive activity, firstly demonstrated through ACE inhibition and anti-dipsogen, then confirmed through endothelium-dependent and Ca^{++} antagonistic pathway (Ali *et al.* 2021, Williams *et al.* 1997). Furthermore, flavonoids and phenolic compounds such as quercetin, quercitrin, myricitrin, kaempferol, rutin, gallic acid and protocatechuic acid isolated from this plant are ACE inhibitors contributing to the reduction of vascular oxidative stress (Meda *et al.* 2023). Bioactive compounds identified in *M. charantia* plays key roles in its CVDs management. Cucurbitane-like triterpenoids, including momordicin I, charantin, and karavilosides, inhibit ACE and increase NO production (Xiao *et al.* 2024). Bioactive peptides and proteins isolated from this plant species, such as polypeptide-p and mcIRBP-19, improve endothelial function and are involved in the regulation of metabolic pathways (Adenosine Monophosphate Kinase), inducing indirect effects on blood pressure (Xiao *et al.* 2024). Flavonoids and phenolic compounds, such as quercetin, gallic acid, and catechins, exert antioxidant effects to protect against vascular oxidative stress, while saponins and sterols, including charantin, are lipid-lowering agents that improve cardiovascular health and play crucial roles in the prevention of hypertension (Jia *et al.* 2017, Oyelere *et al.* 2022). For *A. muricata*, alkaloids including reticulin, coreximine, and anomurine possess vasorelaxant effects that modulate the cardiovascular system, while flavonoids and phenolic compounds such as quercetin, kaempferol, rutin, and chlorogenic acid exert antioxidant activities and reduce vascular oxidative stress. Acetogenins such as annonacin, annonacin A, and muricatocin activate the mitochondrial respiratory chain, playing indirect roles in cardiovascular effects (Zubaidi *et al.* 2023). Tropane alkaloids, the main compounds in *D. metel*, such as atropine, hyoscyamine, scopolamine, and anisodamine, block muscarinic receptors and induce smooth muscle relaxation, thus causing indirect vasodilation. While, the withanolides, flavonoids, and phenolic compounds in this plant have anti-inflammatory and antioxidant activities that modulate vascular oxidative stress and protect against endothelial damage, and *β*-Sitosterol has hypolipidemic and cardioprotective effects (Alam *et al.* 2021). *Z. officinale* contains compounds directly involved in the plant's vasodilatory activity, such as 6-gingerol, 8-gingerol, 10-gingerol, 6-shogaol, and paradols, which stimulate NO production and inhibit Ca^{++} channels (Mao *et al.* 2019). Furthermore, these compounds contribute to the plant's antioxidant activity, as do other molecules such as zingerone, gingerdiones, quercetin, ferulic acid, and caffeic acid, which improve vascular function (Van *et al.* 2024). For *C. limon*, several bioactive compounds are involved in CVD management through various mechanisms. Hesperidin, diosmin, eriocitrin, quercetin, and limocitrin increase NO production, improve endothelial function, and partially inhibit ACE contributing to its vasodilatory effect (Klimek-Szczykutowicz *et al.* 2020). Besides, this species is rich in ascorbic acid (Vitamin C) and other phenolic acids, such as ferulic and caffeic acids, which are powerful antioxidants improving arterial stiffness, protecting vascular damage that contribute indirectly to the antihypertensive activity of this species (Jayadi *et al.* 2026). *A. theiformis* is mostly used in Madagascar and the Indian Ocean regions for its antihypertensive property which is based on a synergy of mechanisms of mangiferin inhibition of ACE, oxidative stress reduction by phenolic compounds, and cardioprotective effects of triterpenes (Grauzdytė *et al.* 2020, Picot *et al.* 2017, Soidrou *et al.* 2014). Monounsaturated fatty acids (primarily oleic acid) in *P. americana* improve endothelial function, reduce blood pressure, decrease LDL cholesterol, and increase HDL cholesterol. *β*-sitosterol, on the other hand, reduces cholesterol and helps prevent ATS. Phenolic compounds such as quercetin, catechins, and phenolic acids are antioxidants, aid in vascular protection, and improve the bioavailability of NO, contributing to prevent CVD (Nascimento *et al.* 2025, Olas 2024). *C. coccineum* traditional use is more focus on CA (FL = 90.91%) for Comorian people while in other countries this species is used to alleviate hypertension. Its antihypertensive activity is based on the synergy of mechanisms due to the presence of antioxidant flavonoids and vasodilator triterpenes such as cycloartane, oleanane, ursane derivatives, triterpenic glycosides (Chinsembu 2023, Eloff *et al.* 2008). Pentacyclic triterpenoids such as lantadene A, lantadene B, oleanolic acid, and camaric acid from *L. camara* are vasodilators of smooth muscle and anti-inflammatory agents for the blood vessels. Their synergistic effects, combined with the antioxidant activity of the phenolic compounds in this plant, contribute significantly to its activity on the cardiovascular system (Ramírez *et al.* 2025). Curcuminoids, including curcumin, demethoxycurcumin, and bisdemethoxycurcumin, are the main vasodilators (by increasing endothelial NO), ACE inhibitors, antioxidants, and endothelial function enhancers in *C. longa* (Anas *et al.* 2024). Other phenolic compounds also contribute to its antioxidant activity, its ability to protect blood vessels, and its role in preventing endothelial dysfunction (Elhawary *et al.* 2024). These active principles make *C. longa* widely used to prevent CVD, primarily CVA (FL = 62.50%) in Comoros. For *A. vera*, the antihypertensive and cardioprotective effects are indirect and multifactorial, primarily linked to the antioxidant, lipid-lowering, and anti-inflammatory effects of anthraquinones, phytosterols, polysaccharides, and phenolic compounds (Kumar *et al.* 2024). Anthraquinones, including aloin, aloe-emodin, and emolin, and phytosterols, including lophenol and cycloartanol, have lipid-lowering effects by reducing LDL and cholesterol (Catalano *et al.* 2024, Kooshki *et al.* 2024). These properties contribute to improving the cardiovascular profile

and the cardiac electrical modulation. *O. gratissimum* is used by Comorian people to treat VT (FL = 50%) and CVA (FL = 50%) due to the presence bioactive compounds such as phenolics, organic acids and terpenes identified in this species. Phenolic compounds and organic acids such as quercetin, kaempferol, luteolin, apigenin, rosmarinic acid, caffeic acid, chlorogenic acid, gallic acid, and ellagic acid, stimulate NO production, facilitating vasodilation, and possess antioxidant activities that help protect the endothelium by reducing vascular oxidative stress (Ugbogu *et al.* 2021). In addition, chlorogenic acid, gallic acid, and ellagic acid are ACE inhibitors, while the essential oils, composed primarily of eugenol, thymol, carvacrol, linalool, and 1,8-cineole, have a direct vasorelaxant effect and modulate vascular tone (Udi *et al.* 2025, Ugbogu *et al.* 2021).

Plant species with limited data

Some species have been reported to possess pharmacological properties that could contribute to CVD or symptom-relevant management. *A. conyzoides* is preferably used by Comorian people to treat CA (FL = 80%) to HTA (FL = 20%). In Madagascar, this species is preferably used to treat HTA and have already been proved to possess vasorelaxant property (Razafindrakoto *et al.* 2020). No studies to date have shown the direct effect of the active principles of *A. conyzoides* on CA; however, several identified bioactive compounds from this plant possess reasonable antiarrhythmic mechanisms in the stabilization of cardiac membranes, the modulation of ion channels (Ca^{2+}, K^{+}), and the reduction of myocardial oxidative stress, such as quercetin, kaempferol and other flavones (Adebayo *et al.* 2010).

Concerning *D. viscosa* active compounds involved in HTA (FL = 75%), flavonoids other phenolics, which are the major compounds of this species, including isorhamnetin, quercetin derivatives, dodoviscins, viscomarfadol, epicatechin, catechin, and C-alkylated flavonols, are stimulators of endothelial NO production causing vasodilation. These compounds are also vascular antioxidants reducing oxidative stress and protecting the endothelium (Alanazi *et al.* 2023; Almarfadi *et al.* 2024). In addition, some cardiac glycosides from this species possess positive inotropic effects increasing myocardial contractility which could explain its use in HF treatment (Hossain 2019).

P. betle exhibits significant cardiovascular potential in the treatment of HTA (FL = 50%) and VT (FL = 33.33%). Its HTA and VT effects are primarily attributed to hydroxychavicol and eugenol, which have vasodilatory and antithrombotic effects, associated with the antioxidant and vaso-protective activity of flavonoids in this species (Baviskar *et al.* 2017, Biswas *et al.* 2022). *A. indica* is used by Comorian people to treat CVA (55.56%) and ATS (FL = 33.33%). Bioactive compounds in this species play crucial roles as cardioprotective and anti-atherosclerotic. Mechanisms underlying the protective effect of this species against HTA include Ca^{2+} channels blockade, up-regulation of extracellular-signal regulator protein kinase 1/2 and nuclear factor erythroid 2-related factor 2 gene expression, and serum normalization of NO bioavailability. While its protective effects against hyperlipidemia are mainly due to antioxidant compounds which inhibit the oxidative damage of lipoproteins (Yarmohammadi *et al.* 2021). Besides, limonoids such as nimbolide and nimbidin are vascular anti-inflammatories which inhibit pro-inflammatory cytokines and reduce plaque progressions (Sarkar *et al.* 2021).

S. occidentalis is used in four categories of CVD including HF, ATS, VT, and CVA with a FL of 25% each other. Its cardiovascular effects are primarily linked to flavonoids such as quercetin, kaempferol, and luteolin, which are antioxidants, antiatherogenic, and antiplatelet agents; anthraquinones such as emodin, chrysophanol, aloe-emodin, and physcion, which are lipid-lowering and anti-inflammatory; and sterols such as β-sitosterol for lipid regulation (Nde *et al.* 2022, Singh *et al.* 2020). However, the anthraquinones and alkaloids in this plant showed toxicity at higher doses, which is a major limitation and makes its therapeutic use in CVD inadvisable without strict supervision (Galambi *et al.* 2025). Overall, *A. occidentale* has vasodilatory, cardiomodulatory, and endothelial-protective effects. This plant is primarily used by the Comorians for HTA treatment (FL = 80%). Its antihypertensive activity is based on the synergistic mechanisms of the bioactive compounds identified in this plant (Tchikaya *et al.* 2011). The phenolic compounds and organic acids, including quercetin, kaempferol, catechins, and phenolic acids, are potent antioxidants, vascular anti-inflammatories, and stimulators of NO production, and they protect the endothelium (Fusco *et al.* 2020). Anacardic acids, cardanols, cardols, and terpenoids such as limonene, p-phellandrene, and germacrene are direct vasodilators identified from this species (Arise *et al.* 2021). The peptides in cashew nuts inhibit ACE (Meneguelli *et al.* 2024). Among the other species, *N. sativa, A. cepa, C. verum, P. guajava, S. aromaticum,* and *B. pilosa* have been demonstrated for their antihypertensive activity (Jafari *et al.* 2025, Lachovicz *et al.* 2025, Maideen *et al.* 2020). While, *N. sativa, A. graveolens, P. guajava, T. indica, C. papaya*, and *H. annuus* have hypolipidemic property, and *A. cepa, S. aromaticum, and M. indica* are antiaggregant, antithrombotic, and cardioprotective respectively (Lachovicz *et al.* 2025, Maideen *et al.* 2020).

Under-investigated species

Although our preliminary study on the leaves of *D. comorensis* showed that the extracts derived from the leaves of this species demonstrated vasorelaxant and diuretic activities (Ahmed *et al.* 2026), this endemic species with *P. comorensis* as well as the other under-investigated species represent priorities for further phytochemical and pharmacological investigation because their traditional use relative to CVD management is not sufficiently documented.

Conclusion

This study highlights the Comorian community's extensive ethnomedicinal expertise in the treatment of CVD, based on the knowledge documented from 571 volunteer participants across Ngazidja island. 79 medicinal plant species belonging to 42 families were recorded where the ICF observed for the CVD categories indicates substantial convergence with traditional knowledge. *M. oleifera* and *A. sativum* emerge particularly as prominent according to their UV, FC and FL, while the documentation of endemic species such as *D. comorensis* and *P. comorensis* shows that they constitute taxa of particular interest for further investigation. These findings identify species and their traditional uses that may provide relevant hypotheses for future phytochemical, pharmacological and clinical studies. By documenting this medicinal plant diversity in Ngazidja island, this study contributes to the characterisation and preservation of Comorian traditional knowledge. However, further studies including phytochemistry, pharmacology and clinical expertise are required to determine and validate the safety, biological activity and therapeutic relevance of these traditionally used plants.

Declarations

List of abbreviations: ACE - Angiotensin-converting enzyme; ATS - Atherosclerosis; CA - Cardiac arrhythmia; CVA - Cerebrovascular accidents; CVD - cardiovascular diseases; DOCA - Deoxycorticosterone acetate; FC - Frequency of citation; FL - Fidelity level; FUV - Family use value; HF - Heart failure; HTA - Arterial Hypertension; ICF - Informant consensus factor; NO - Nitric oxide; RFC - Relative frequency of citation; UV - Use value; VT - Venous thrombosis.

Ethics approval and consent to participate: All experiments were performed in accordance with relevant guidelines and regulations of the declaration of Helsinki. Informed consent and agreement to disclose the respondent informant publication were obtained. The study was approved by the National Ethic Committee for Life and Health Sciences of the University of the Comoros under the number 007/CEA/FST/2019.

Consent for publication: Not applicable

Availability of data and materials: The data from this study have not been deposited in public repositories but are available from the corresponding author upon reasonable request.

Competing interests: The authors declare no competing interests.

Funding: The current work was supported by Princess Nourah bint Abdulrahman University Researchers Supporting Project number (PNURSP2026R419), Princess Nourah bint Abdulrahman University, Riyadh, Saudi Arabia.

Author contributions: A.A. Collected the data, participated in the theoretical background, and wrote the original draft. F.J.E.M. Co-wrote the original draft, helped in formal analysis and validated the specimen identification. Z.R.R. participated in conceptualization, review of the original draft and socio-demographic data analysis. S.M.V. analyzed the ethnobotanical data and reviewed the original draft. H.S. Collected the data and reviewed the original draft. M.S.H. Collected the data and reviewed the original draft. A.O.D. Collected the data and reviewed the original draft. A.Y.B. Participated in statistical analysis and ethnobotanical data analysis and supervised the study. M.A. Identified the specimens and reviewed the original draft. D.R. Participated in the conceptualization of the study, supervised the study and reviewed the original draft. N.T. Participated in the study conceptualization, data analysis and discussion, reviewed and edited the final manuscript.

Acknowledgements

The authors express their sincere gratitude to the traditional healers and practitioners of Ngazidja Island (Comoros) for sharing their invaluable medicinal knowledge.

Literature cited

Abeid SN. 2026. The growing burden of hypertension, diabetes, and obesity in the Comoros: a call for national action. The Lancet Regional Health - Africa 2:100012. doi: 10.1016/j.lanafr.2025.100012

Abou A, Faramalala MH, Edmond R. 2022. Bioecological Characterization of Heritage Plant Species of the Wet Forests of Anjouan (Comoros). Greener Journal of Agricultural Sciences 12(2): 102-119. https://gjournals.org/GJAS/Publication/2022/2/HTML/050922048%20Abou%20et%20al.htm

Adebayo AH, Tan NH, Akindahunsi AA, Zeng GZ, Zhang YM. 2010. Anticancer and antiradical scavenging activity of *Ageratum conyzoides* L. (Asteraceae). Pharmacognosy Magazine 6(21): 62. doi: 10.4103/0973-1296.59968

Adsersen A, Adsersen H. 1997. Plants from Reunion Island with alleged antihypertensive and diuretic effects-an experimental and ethnobotanical evaluation. Journal of Ethnopharmacology 58(3): 189-206. doi: 10.1016/S0378-8741(97)00100-1

Agoyi EE, Okou FAY, Assogbadjo EA, Sinsin B. 2015. Medicinal uses of *Moringa oleifera* in southern Benin (West Africa). Acta Horticulturae 1158: 303-308. doi: 10.17660/ActaHortic.2017.1158.34

Ahmed A, Donno D, Razafindrakoto ZR, Tombozara N, Ahamada-Himidi A, Randrianirina MJ, Gamba G, Rajaonarison JF, Beccaro, GL, Ramanitrahasimbola D. 2026. Sustainable Use of Natural Resources and Traditional Medicine in Tropical Countries: Uncovering the Main Antioxidant Compounds and Antihypertensive Potential of the *Diospyros comorensis* Leaves as Health-Promoting Food Application for Local Population. Plants 15(11): 1757. doi: 10.3390/plants15111757

Alam W, Khan H, Khan SA, Nazir S, Akkol EK. 2021. *Datura metel*: A review on chemical constituents, traditional uses and pharmacological activities. Current Pharmaceutical Design 27(22): 2545-2557. doi: 10.2174/1381612826666200519113752

Alanazi AZ, Al-Rejaie SS, Ahmed MM, Alhazzani K, Alhosaini K, Sobeai HMA, Alsanea S, Alam P, Almarfadi OM, Alqahtani AS, Alhamed A, Alqinyah M, Alhamami HN, Almutery MF, Mohany M. 2023. Protective role of *Dodonaea viscosa* extract against streptozotocin-induced hepatotoxicity and nephrotoxicity in rats. Saudi Pharmaceutical Journal 31(8): 101669. doi: 10.1016/j.jsps.2023.06.002

Ali MZ, Mehmood MH, Saleem M, Akash MSH, Malik A. 2021. Pharmacological evaluation of *Euphorbia hirta*, *Fagonia indica* and *Capparis decidua* in hypertension through *in-vivo* and *in vitro*-assays. Heliyon 7(10). doi: 10.1016/j.heliyon.2021.e08094

Allaoui A. 2011. Rapport de consultation sur les politiques et la gouvernance. Union des Comores, Vice-Présidence chargée du ministère de l'Agriculture, de la Pêche, de l'Environnement, de l'Énergie et de l'Artisanat, Projet ASCLME 00047255, 43 p.

Almarfadi OM, Siddiqui NA, Shahat AA, Fantoukh OI, El Gamal AA, Raish M, Bari A, Iqbal M, Alqahtani AS. 2024. Isolation of a novel isoprenylated phenolic compound and neuroprotective evaluation of *Dodonaea viscosa* extract against cerebral ischaemia-reperfusion injury in rats. Saudi Pharmaceutical Journal 32(1): 101898. doi: 10.1016/j.jsps.2023.101898

Amujoyegbe OO, Idu M, Agbedahunsi JM, Erhabor JO. 2016. Ethnomedicinal Survey of medicinal plants used in the management of sickle cell disorder in Southern Nigeria. Journal of Ethnopharmacology 185: 347-360. doi: 10.1016/j.jep.2016.03.042

Anas M, Falak A, Khan A, Khattak WA, Nisa SG, Aslam Q, Khan KA, Saleem MH, Fahad S. 2024. Therapeutic potential and agricultural benefits of curcumin: a comprehensive review of health and sustainability applications. Journal of Umm Al-Qura University for Applied Sciences 1-16. doi: 10.1007/s43994-024-00200-7

Anwar F, Latif S, Ashraf M, Gilani AH. 2007. *Moringa oleifera*: a food plant with multiple medicinal uses. Phytotherapy Research 21(1): 17-25. doi: 10.1002/ptr.2023

Arise RO, Taofeek OO, Babaita K, Adeoye RI, Osemwegie O. 2021. Blood pressure and sugar regulating potentials of *Anarcadium occidentale* nut globulin and albumin hydrolysates. Heliyon 7(3). doi: 10.1016/j.heliyon.2021.e06384

Awoke A, Tahir M. 2025. Traditional uses of family Asteraceae in Ethiopia: A review of ethnobotanical knowledge and therapeutic applications. Ethnobotany Research and Applications 31(55): 1-25. doi: 10.32859/era.31.55.1-25

Baviskar HP, Dhake GT, Kasai MA, Chaudhari NB, Deshmukh TA. 2017. Review of *Piper betle*. Research Journal of Pharmacognosy and Phytochemistry 9(2): 128. doi: 10.5958/0975-4385.2017.00024.3

Bhattacharya A, Tiwari P, Sahu PK, Kumar S. 2018. A review of the phytochemical and pharmacological characteristics of *Moringa oleifera*. Journal of Pharmacy and Bioallied Sciences 10(4): 181-191. doi: 10.4103/JPBS.JPBS_126_18

Biswas P, Anand U, Saha SC, Kant N, Mishra T, Masih H, Bar A, Pandey DK, Jha NK, Majumder M, Das N, Gadekar VS, Shekhawat MS, Kumar M, Radha Proćków J, Pérez de la Lastra JM, Dey A. 2022. Betelvine (*Piper betle* L.): A comprehensive insight into its ethnopharmacology, phytochemistry, and pharmacological, biomedical and therapeutic attributes. Journal of Cellular and Molecular Medicine 26(11): 3083-3119. doi: 10.1111/jcmm.17323

Bodeker G, Ghat KKS, Burley J, Vantomme P. (Eds.). 1997. Medicinal plants for forest conservation and health care. Non-Wood Forest Products 11. Global Initiative for Traditional Systems of Health. FAO, Rome, 158 pp.

Borlinghaus J, Albrecht F, Gruhlke MCH, Nwachukwu ID, Slusarenko AJ. 2014. Allicin: Chemistry and biological properties. Molecules 19(8): 12591-12618. doi: 10.3390/molecules190812591

Bozkurt B, Coats AJS, Tsutsui H, Abdelhamid M, Adamopoulos S, Albert N. 2021. Universal definition and classification of heart failure. European Journal of Heart Failure 23(3): 352-380. doi: 10.1002/ejhf.2115

Brignole M. 2007. Diagnosis and treatment of syncope. Heart 93(1): 130-136. doi: 10.1136/hrt.2005.080713

Catalano A, Ceramella J, Iacopetta D, Marra M, Conforti F, Lupi FR, Gabriele D, Borges F, Sinicropi MS. 2024. *Aloe vera*-An extensive review focused on recent studies. Foods 13(13): 2155. doi: 10.3390/foods13132155

Çakılcıoğlu U. 2020. An ethnobotanical field study; traditional foods production and medicinal utilization of *Gundelia* L. species in Tunceli (Turkey). Indian Journal of Traditional Knowledge 19(4): 714-718.

Chen L, Cheng F, Chen H, Shu G. 2024. Preparation and identification of novel angiotensin-I-converting enzyme inhibitory peptides from *Moringa oleifera* leaf. LWT - Food Science and Technology 205: 116472. doi: 10.1016/j.lwt.2024.116472

Chinsembu KC. 2023. Ethnopharmacology, antimicrobial potency, and phytochemistry of African *Combretum* species. Plants 12: 512. doi: 10.3390/plants12030512

Cornelius SF, Van Wyk BE. 2024. An updated inventory of medicinal and ritual plants of southern Africa. Journal of Ethnopharmacology 332: p. 118361. doi: 10.1016/j.jep.2024.118361

Divya S, Pandey VK, Dixit R, Rustagi S, Suthar T, Atuahene D, Nagy V, Ungai D, Ahmed AEM, Kovács B, Shaikh AM. 2024. Exploring the phytochemical, pharmacological and nutritional properties of *Moringa oleifera*: A comprehensive review. Nutrients 16(19): 3423. doi: 10.3390/nu16193423

Elhawary EA, Moussa AY, Singab ANB. 2024. Genus Curcuma: Chemical and ethnopharmacological role in aging process. BMC Complementary Medicine and Therapies 24(1): 31. doi: 10.1186/s12906-023-04317-w

El Moumen B, Yamni M, Ouhammou A, Douira A. 2025. Ethnobotanical study of medicinal plants used to treat cardiovascular diseases in the Fez-Meknes region, Morocco. Ethnobotany Research and Applications 30: 1-25. doi: 10.32859/era.30.43.1-25

Eloff JN, Katerere DRP, McGaw LJ. 2008. The biological activity and chemistry of the southern African Combretaceae. Journal of Ethnopharmacology 119(3): 686-699. doi: 10.1016/j.jep.2008.07.051

El-Saber Batiha G, Magdy Beshbishy A, Wasef LG, Elewa YHA, Al-Sagan AA, Abd El-Hack ME, Taha AE, Abd-Elhakim YM, Prasad Devkota H. 2020. Chemical constituents and pharmacological activities of garlic (*Allium sativum* L.): A review. Nutrients 12(3): 872. doi: 10.3390/nu12030872

Fakudze NT, Sarbadhikary P, George BP, Abrahamse H. 2023. Ethnomedicinal Uses, Phytochemistry, and Anticancer Potentials of African Medicinal Fruits: A Comprehensive Review. Pharmaceuticals 16(8): 1117. doi: 10.3390/ph16081117

Fusco R, Cordaro M, Siracusa R, Peritore AF, Gugliandolo E, Genovese T, D'Amico R, Crupi R, Smeriglio A, Mandalari G, Impellizzrri D, Cuzzocrea S, Di Paola R. 2020. Consumption of *Anacardium occidentale* L. (Cashew nuts) inhibits oxidative stress through modulation of the Nrf2/HO− 1 and NF-kB pathways. Molecules 25(19): 4426. doi: 10.3390/molecules25194426

Galambi AY, Shitu A, Oluwasesan B. 2025. A Comprehensive Literature Review on the Phytochemistry and Pharmacological Investigation of *Senna occidentalis*. Records of Chemical Sciences 4(4): 46-63. doi: 10.33003/

Gbolade A. 2012. Ethnobotanical study of plants used in treating hypertension in Edo State of Nigeria. Journal of Ethnopharmacology 144(1): 1-10. doi: 10.1016/j.jep.2012.07.018

Grauzdytė D, Pukalskas A, El Kalamouni C, Venskutonis PR. 2020. Mangiferin-rich products from *Aphloia theiformis* leaves: Phytochemical characterization and antioxidant properties. Molecules 25(9): 2081. doi: 10.3390/molecules25092081

Ha MT, Vu NK, Tran TH, Kim JA, Woo MH, Min BS. 2020. Phytochemical and pharmacological properties of *Myristica fragrans* Houtt.: an updated review. Archives of Pharmacal Research 43(11): 1067-1092. doi: 10.1007/s12272-020-01285-4

Hoffman B, Gallaher T. 2007. Importance indices in ethnobotany. Ethnobotany Research and Applications 5: 201-218. https://ethnobotanyjournal.org/index.php/era/article/view/130

Hossain MA. 2019. Biological and phytochemicals review of Omani medicinal plant *Dodonaea viscosa*. Journal of King Saud University - Science 31(4): 1089-1094. doi: 10.1016/j.jksus.2018.09.012

Huang Q, Jiang Z, Shi B, Meng J, Shu L, Hu F, Mi J. 2025. Characterisation of cardiovascular disease (CVD) incidence and machine learning risk prediction in middle-aged and elderly populations: data from the China health and retirement longitudinal study (CHARLS). BMC Public Health 25(1): 518. doi: 10.1186/s12889-025-21609-7

Iadecola C, Gottesman RF. 2019. Neurovascular and cognitive dysfunction in hypertension. Circulation Research 124(7): 1025-1044. doi: 10.1161/CIRCRESAHA.118.313260

INSEED 2018. Recensement Général de la Population et de l'Habitat 2017. Institut National de la Statistique et des Études Économiques et Démographiques (INSEED), Union des Comores. Available at: https://www.nada.inseed-comores.org

Jafari A, Mardani H, Faghfouri AH, Fashtali ZM, Hashemi M, Yousefabady MA, Javid R, Golabi S, Arghavan B, Musazadeh V, Naghashpour M. 2025. Does *Nigella sativa* supplementation improve cardiovascular disease risk factors? A comprehensive

GRADE-assessed systematic review and dose-response meta-analysis of 82 randomized controlled trials. Pharmacological Research 107882. doi: 10.1016/j.phrs.2025.107882

Jayadi YI, Sulaeman A, Palupi E, Dewi M, Hardinsyah. 2026. Harnessing the power of lemon (*Citrus limon*) for hypertension: A systematic review of clinical evidence. Diversity: Disease Preventive of Research Integrity 6(2): 58-71. doi: 10.24252/diversity.v6i2.62425

Jia S, Shen M, Zhang F, Xie J. 2017. Recent advances in *Momordica charantia*: functional components and biological activities. International Journal of Molecular Sciences 18(12): 2555. doi: 10.3390/ijms18122555

Joseph P, Lanas F, Roth G, Lopez-Jaramillo P, Lonn E, Miller V, Mente A, Leong D, Schwalm J-D, Yusuf S. 2025. Cardiovascular disease in the Americas: the epidemiology of cardiovascular disease and its risk factors. The Lancet Regional Health - Americas 42.

Jouad H, Haloui M, Rhiouani H, El Hilaly J, Eddouks M. 2001. Ethnobotanical survey of medicinal plants used for the treatment of diabetes, cardiac and renal diseases in the North centre region of Morocco (Fez-Boulemane). Journal of Ethnopharmacology 77(2-3): 175-182. doi: 10.1016/s0378-8741(01)00289-6

Kariuki PM. 2018. *Use and conservation of wild medicinal food plants in Loita, Narok County Kenya*. PhD dissertation, University of Nairobi, Kenya. UoN Digital Repository. https://agris.fao.org/search/en/providers/126159/records/68d2a392b3b40a20d618885d

Khatun S, Parlak KU, Polat R, Cakilcioglu U. 2012. The endemic and rare plants of Maden (Elazig) and their uses in traditional medicine. Journal of Herbal Medicine 2(3): 68-75. doi: 10.1016/j.hermed.2012.06.003

King K, Steggall M. 2014. Haematuria: from identification to treatment. British Journal of Nursing 23(Sup9): S28-S32. doi: 10.12968/bjon.2014.23.Sup9.S28

Klimek-Szczykutowicz M, Szopa A, Ekiert H. 2020. *Citrus limon* (Lemon) phenomenon-a review of the chemistry, pharmacological properties, applications in the modern pharmaceutical, food, and cosmetics industries, and biotechnological studies. Plants 9(1): 119. doi: 10.3390/plants9010119

Kooshki A, Memarzadeh MR, Rakhshani MH, Akbarzadeh R, Tofighiyan T, Foroumandi E. 2024. *Aloe vera* supplementation improves cardiovascular risk factors in hemodialysis patients: A randomized, double-blind, placebo-controlled trial. Avicenna Journal of Phytomedicine 14(4): 422. doi: 10.22038/ajp.2023.23447

Korkmaz M, Karakuş S, Selvi S, Çakılcıoğlu U. 2016. Traditional knowledge on wild plants in Üzümlü (Erzincan-Turkey). Indian Journal of Traditional Knowledge 15(4): 538-545.

Kumar P. 2006. The Economics of Medicinal Plants: Are High Commercial Values Enough to Ensure Biodiversity Conservation? Pp 9-15 in Conserving Medicinal Species: securing a healthy future. Miththapala, S. (ed) IUCN: Ecosystems and Livelihoods Group, Asia, pp. 184. https://portals.iucn.org/library/node/8879

Kumar S, Kalita S, Basumatary IB, Kumar S, Ray S, Mukherjee A. 2024. Recent advances in therapeutic and biological activities of *Aloe vera*. Biocatalysis and Agricultural Biotechnology 57: 103084. doi: 10.1016/j.bcab.2024.103084

Lachovicz R, Ferro-Lebres V, Almeida-de-Souza J. 2025. Phytotherapy: a systematic review for the treatment of hypertension. Journal of Herbal Medicine 50: 100985. doi: 10.1016/j.hermed.2024.100985

Maideen NMP, Balasubramanian R, Ramanathan S. 2020. *Nigella Sativa* (Black seeds); a Potential herb for the Pharmacotherapeutic Management of Hypertension-A Review. Current Cardiology Reviews 17(4). doi: 10.2174/1573403x16666201110125906

Malik K, Ahmad M, Bussmann RW, Tariq A, Ullah R, Alqahtani AS, Shahat AA, Rashid N, Zafar M, Sultana S, Shah SN. 2018. Ethnobotany of anti-hypertensive plants used in northern Pakistan. Frontiers in Pharmacology 9: 789. doi: 10.3389/fphar.2018.00789

Mangoale RM, Afolayan AJ. 2020. Comparative phytochemical constituents and antioxidant activity of wild and cultivated *Alepidea amatymbica* Eckl & Zeyh. BioMed Research International 2020(1): 5808624. doi: 10.1155/2020/5808624

Mao QQ, Xu XY, Cao SY, Gan RY, Corke H, Beta T, Li HB. 2019. Bioactive compounds and bioactivities of ginger (*Zingiber officinale* Roscoe). Foods 8(6): 185. doi: 10.3390/foods8060185

Marappan K, Sadasivam S, Natarajan N, Arumugam VA, Lakshmaiah K, Thangaraj M, Gopal MG, Asokan A. 2025. Underutilized fruit crops as a sustainable approach to enhancing nutritional security and promoting economic growth. Frontiers in Sustainable Food Systems 9: 1618112. doi: 10.3389/fsufs.2025.1618112

Masenga SK, Kirabo A. 2023. Hypertensive heart disease: risk factors, complications and mechanisms. Frontiers in Cardiovascular Medicine 10: 1205475. doi: 10.3389/fcvm.2023.1205475

McDonagh TA, Metra M, Adamo M, Gardner RS, Baumbach A, Böhm M, Burri H, Butler J, Čelutkienė J, Chioncel O, Cleland JGF, Crespo-Leiro MG, Farmakis D, Gilard M, Heymans S, Hoes AW, Jaarsma T, Janskowska EA, Lainscak M, Lam CSP, Lyon AR, McMurray JJV, Mebazaa A, Mindham R, Muneretto C, Piepoli MF, Price S, Rosano GMC, Ruschitzka, F, Skibelund AK, ESC Scientific Document Group. 2023. 2023 Focused Update of the 2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: Developed by the task force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC) With the special contribution of the Heart Failure Association (HFA) of the ESC. European Heart Journal 44(37): 3627-3639. doi: 10.1093/eurheartj/ehad195

Meda RNT, Kam SE, Kagambega W, Zongo E, Ouedraogo C, Segda A, Koama BK, Somda FT, Zongo E, Ouedraogo GA. 2023. A review on bioactive compounds isolated from *Euphorbia hirta* L. American Journal of Plant Sciences 14: 710-726. doi: 10.4236/ajps.2023.146048

Meneguelli TS, Kravchychyn ACP, Wendling AL, Dionísio AP, Bressan J, Martino HSD, Tako E, Hermsdorff HHM. 2024. Cashew nut (*Anacardium occidentale* L.) and cashew nut oil reduce cardiovascular risk factors in adults on weight-loss treatment: a randomized controlled three-arm trial (Brazilian Nuts Study). Frontiers in Nutrition 11: 1407028. doi: 10.3389/fnut.2024.1407028

Menichetti F, Berteotti C, Schirinzi V, Poli C, Arrighi R, Leone A. 2025. *Moringa oleifera* and Blood Pressure: Evidence and Potential Mechanisms. Nutrients 17(7): 1258. doi: 10.3390/nu17071258

Mensah GA, Fuster V, Murray CJL, Roth GA. 2023. Global Burden of Cardiovascular Diseases and Risks, 1990-2022. Journal of the American College of Cardiology 82(25): 2350-2473. doi: 10.1016/j.jacc.2023.11.007

Mofokeng MM, du Plooy CP, Araya HT, Amoo SO, Mokgehle SN, Pofu KM, Mashela PW. 2022. Medicinal plant cultivation for sustainable use and commercialisation of high-value crops. South African Journal of Science 118(7-8): 1-7. doi: 10.17159/sajs.2022/12190

Mwami B, Maňourová A, Hendre PS, Muchugi A, Verner V, Kariuki P, Sulaiman N, Polesny Z. 2024. Traditional knowledge, use, and management of *Moringa oleifera* among the Mijikenda Community in Kilifi, Kenya. Plants 13(24): 3547. doi: 10.3390/plants13243547

Nascimento APS, Duarte MEM, Rocha APT, Barros AN. 2025. Bioactive compounds, technological advances, and sustainable applications of avocado (*Persea americana* Mill.): A critical review. Foods 14(15): 2746. doi: 10.3390/foods14152746

Nde AL, Chukwuma CI, Erukainure OL, Chukwuma MS, Matsabisa MG. 2022. Ethnobotanical, phytochemical, toxicology and anti-diabetic potential of *Senna occidentalis* (L.) link; A review. Journal of Ethnopharmacology 283: 114663. doi: 10.1016/j.jep.2021.114663

Nureye D, Tadege G, Dubale S, Kebebe D, Suleman S, Nguelefack-Mbuyo EP. 2025. Medicinal plants administered to control hypertension in Ethiopia: ethnomedicine, pharmacology, nutraceutical, phytochemistry, toxicology, and policy perspectives. Frontiers in Cardiovascular Medicine 12: 1514911. doi: 10.3389/fcvm.2025.1514911

Odukoya JO, Odukoya JO, Mmutlane EM, Ndinteh DT. 2022. Ethnopharmacological Study of Medicinal Plants Used for the Treatment of Cardiovascular Diseases and Their Associated Risk Factors in sub-Saharan Africa. Plants 11(10): 1387. doi: 10.3390/plants11101387

Oguta JO, Breeze P, Wambiya E, Kibe P, Akoth C, Otieno P, Dodd PJ. 2025. Application of decision analytic modelling to cardiovascular disease prevention in Sub-Saharan Africa: a systematic review. Communications Medicine 5(1): 46. doi: 10.1038/s43856-025-00772-3

Olas B. 2024. The pulp, peel, seed, and food products of *Persea americana* as sources of bioactive phytochemicals with cardioprotective properties: A review. International Journal of Molecular Sciences 25(24): 13622. doi: 10.3390/ijms252413622

Oyelere SF, Ajayi OH, Ayoade TE, Pereira GBS, Owoyemi BCD, Ilesanmi AO, Akinyemi OA. 2022. A detailed review on the phytochemical profiles and anti-diabetic mechanisms of *Momordica charantia*. Heliyon 8(4). doi: 10.1016/j.heliyon.2022.e09253

Pereira ARA, Velho APM, Cortez DAG, Szerwieski LLD, Cortez LER. 2016. Traditional use of medicinal plants by elderly. Revista Rene 17(3): 427-434. doi: 10.15253/2175-6783.2016000300018

Phillips O, Gentry AH, Reynel C, Wikin P, Galvez-Durand CB. 1994. Quantitative ethnobotany and Amazonian conservation. Conservation Biology 8(1): 225-248. doi: 10.1046/j.1523-1739.1994.08010225.x

Picot MCN, Bender O, Atalay A, Zengin G, Loffredo L, Hadji-Minaglou F, Mahomoodally MF. 2017. Multiple pharmacological targets, cytotoxicity, and phytochemical profile of *Aphloia theiformis* (Vahl.) Benn. *Biomedicine & Pharmacotherapy* 89: 342-350. doi: 10.1016/j.biopha.2017.02.031

Popoola JO, Obembe OO. 2013. Local knowledge, use pattern and geographical distribution of *Moringa oleifera* Lam. (Moringaceae) in Nigeria. Journal of Ethnopharmacology 150(2): 682-691. doi: 10.1016/j.jep.2013.09.043

Rafidison V, Ratsimandresy F, Rakotondrafara A, Rakotondrajaona R, Rasamison VE, Rakotoarisoa FM, Rakotonandrasana SR. 2019. Synthesis and analysis of data on inventories of medicinal plants in Madagascar. Ethnobotany Research and Applications 18: 1-19. doi: 10.32859/era.18.40.1-19

Ramírez J, Armijos C, Espinosa-Ortega N, Castillo LN, Vidari, G. 2025. Ethnobotany, Phytochemistry, and Biological Activity of Extracts and Non-Volatile Compounds from *Lantana camara* L. and Semisynthetic Derivatives-An Updated Review. Molecules 30(4): 851. doi: 10.3390/molecules30040851

Randrianarivony TN, Ramarosandratana AV, Andriamihajarivo TH, Rakotoarivony F, Jeannoda VH, Randrianasolo A, Bussmann RW. 2017. The most used medicinal plants by communities in Mahaboboka, Amboronabo, Mikoboka, Southwestern Madagascar. Journal of Ethnobiology and Ethnomedicine 13(1): 19. doi: 10.1186/s13002-017-0147-x

Razafindrakoto ZR, Tombozara N, Ramanitrahasimbola D, Raoelihajaina DF, Rakotondramanana DA. 2020. Vaso-relaxing activity of *Ageratum conyzoides* Linn. (Asteraceae) aerial parts on isolated rat aorta. American Journal of Innovative Research and Applied Sciences 10(4): 165-171.

Razafindrakoto ZR, Tombozara N, Mahitasoa FJE, Solofoniaina M, Tatafasa ET, Andrianjara C, Ramanitrahasimbola D. 2026. Biological screening of medicinal plants used by SCD patients in the eastern part of Madagascar for their anti-sickling and analgesic activities. South African Journal of Botany 190: 11-20. doi: 10.1016/j.sajb.2025.12.027

Ried K. 2020. Garlic lowers blood pressure in hypertensive individuals, regulates serum cholesterol, and stimulates immunity: An updated meta-analysis and review. Experimental and Therapeutic Medicine 19(2): 1472-1478. doi: 10.3892/etm.2019.8380

Rifat AB, Mitu FY, Haque T, Rahman MA, Mazid MA, Uddin MZ. 2022. An ethnobotanical survey of medicinal plants focusing on cardiovascular diseases used by the local people in and around Dinajpur district, Bangladesh. Journal of the Asiatic Society of Bangladesh, Science 48(1-2): 19-40. doi: 10.3329/jasbs.v48i1-2.64512

Rokaya MB, Uprety Y, Poudel RC, Timsina B, Münzbergová Z, Asselin H, Tiwari A, Shrestha SS, Sigdel SR. 2014. Traditional uses of medicinal plants in gastrointestinal disorders in Nepal. Journal of Ethnopharmacology 158: 221-229. doi: 10.1016/j.jep.2014.10.014

Saive M, Frederich M, Fauconnier ML. 2020. Plants used in traditional medicine in the Comoros archipelago: a review. Biotechnologie, Agronomie, Société et Environnement 24(2): 117-141. https://orbi.uliege.be/handle/2268/246845

Sarkar S, Singh RP, Bhattacharya G. 2021. Exploring the role of *Azadirachta indica* (neem) and its active compounds in the regulation of biological pathways: an update on molecular approach. 3 Biotech 11(4): 178. doi: 10.1007/s13205-021-02745-4

Shang A, Cao SY, Xu XY, Gan RY, Tang GY, Corke H, Mavumengwana V, Li HB. 2019. Bioactive compounds and biological functions of garlic (*Allium sativum* L.). Foods 8(7): 246. doi: 10.3390/foods8070246

Singh H, Chahal P, Mishra A, Mishra AK. 2020. An up-to-date review on chemistry and biological activities of *Senna occidentalis* (L.) Link Family: Leguminosae. Advances in Traditional Medicine 20(3): 263-278. doi: 10.1007/s13596-019-00391-z

Soidrou HS, Bousta D, Lachkar M, Said Hassane SO, El Youbi-Hamsas A, Mansouri LEL, Benjlali J, El-Hajaji H, Farah A. 2014. Phytochemical screening, immunomodulatory and anti-inflammatory activities of the phenolic fraction of *Aphloia theiformis* (Vahl) Benn. plant used in Comorian traditional medicine. Phytothérapie 12(6): 354-359. doi: 10.1007/s10298-014-0875-1

Stadje R, Dornieden K, Baum E, Becker A, Biroga T, Bösner S, Haasenritter J, Keunecke C, Viniol A, Donner-Banzhoff N. 2016. The differential diagnosis of tiredness: a systematic review. BMC Family Practice 17(1): 147. doi: 10.1186/s12875-016-0545-5

Sulola MA, Sibai AM, Damasceno A, Issanov A, Sarria-Santamera A, Orazumbekova B, Norov B, Bicaba, B., Houehanou C, Guwatudde D, Kagaruki GB, Gathecha G, Jorgensen JA, Mwangi KJ, Agoudavi K, Sturua L, Mayige MT, Gurung M, Hwalla N, Lunet N, Mwalim O, McClure RW, Quesnel-Crooks S, Bahendeka S, Atun R, Bärnighausen T, Davies J, Flood D, Geldsetzer P, Jaacks L, Manne-Goehler J, Theilmann M, Vollmer S, Marcus ME. 2025. Use of traditional medicine for hypertension, diabetes and hypercholesterolaemia measured in 71 surveys. Bulletin of the World Health Organization 103(11): 662-674. doi: 10.2471/BLT.25.293665

Tamene S, Negash M, Makonda FB, Chiwona-Karltun L. 2024. Influence of socio-demographic factors on medicinal plant knowledge among three selected ethnic groups in south-central Ethiopia. Journal of Ethnobiology and Ethnomedicine 20(29). doi: 10.1186/s13002-024-00672-1

Tardío J, Pardo-de-Santayana M. 2008. Cultural importance indices: a comparative analysis based on the useful wild plants of Southern Cantabria (Northern Spain). Economic Botany 62(1): 24-39. doi: 10.1007/s12231-007-9004-5

Tchikaya FO, Bantsielé GB, Kouakou-Siransy G, Datté JY, Yapo PA, Zirihi NG, Offoumou MA. 2011. *Anacardium occidentale* Linn. (Anacardiaceae) stem bark extract induces hypotensive and cardio-inhibitory effects in experimental animal models. African Journal of Traditional, Complementary and Alternative Medicines 8(4): 452. doi: 10.4314/ajtcam.v8i4.18

Tombozara N, Mahitasoa FJE, Razafindrakoto ZR, Randriamampionona D, Solofoniaina M, Tata P, Ramanitrahasimbola D, Andrianjara C. 2024. Sickle cell disease: Ethnopharmacological survey in the eastern part of Madagascar. South African Journal of Botany 174: 606-623. doi: 10.1016/j.sajb.2024.09.033

Trotter RT, Logan MH. 1986. Informant consensus: A new approach for identifying potentially effective medicinal plants. In Plants in Indigenous Medicine and Diet: Biobehavioral Approaches. Taylor & Francis, New York, pp. 91-112.

Tsao CW, Aday AW, Almarzooq ZI, Anderson CA, Arora P, Avery CL, Baker-Smith C., Beaton AZ, Boehme AK, Buxton AE, Commodore-Mensah Y, Elkind MSV, Evenson KR, Eze, Nliam C, Fugar S, Generoso G, Heard DG, Hiremath S, Ho J E, Kalani R, Kazi DS, Ko D, Levine DA, Liu J, Ma J, Magnani JW, Michos ED, Mussolino ME, Navaneethan SD, Parikh NI, Poudel R, Rezk-Hanna M, Roth GA, Shah NS, St-Onge MP, Thacker EL, Virani SS, Voeks JH, Wang NY, Wong ND, Wong SS, Yaffe K, Martin SS. 2023. Heart disease and stroke statistics-2023 update: a report from the American Heart Association. Circulation 147(8): e93. doi: 10.1161/CIR.0000000000001123

Udi OA, Oyovwin MO, Adeogun AE. 2025. Exploring the cognitive-enhancing effects of *Ocimum gratissimum*: an ethnopharmacological and phytochemical review. Discover Plants 2(1): 58. doi: 10.1007/s44372-025-00127-1

Ugbogu OC, Emmanuel O, Agi GO, Ibe C, Ekweogu CN, Ude VC, Uche ME, Nnanna RO, Ugbogu EA. 2021. A review on the traditional uses, phytochemistry, and pharmacological activities of clove basil (*Ocimum gratissimum* L.). Heliyon 7(11). doi: 10.1016/j.heliyon.2021.e08404

Van B, Abdalla AN, Algarni AS, Khalid A, Zengin G, Aumeeruddy MZ, Mahomoodally MF. 2024. *Zingiber officinale* roscoe (ginger) and its bioactive compounds in diabetes: a systematic review of clinical studies and insight of mechanism of action. Current Medicinal Chemistry 31(7): 887-903. doi: 10.2174/0929867330666230524122318

Williams LA, Gossell-Williams M, Sajabi A, Barton EN, Fleischhacker R. 1997. Angiotensin converting enzyme inhibiting and anti-dipsogenic activities of *Euphorbia hirta* extracts. Phytotherapy Research 11(5): 401-402. doi: 10.1002/(SICI)1099-1573(199708)11:5%3C401::AID-PTR119%3E3.0.CO;2-T

World Heart Federation. 2024. *Cardiovascular Insights for Comoros*. World Heart Observatory. Available on: https://world-heart-federation.org/world-heart-observatory/countries/comoros/

World Health Organization. 2019. *WHO global report on traditional and complementary medicine 2019*. World Health Organization. Available on: https://apps.who.int/iris/handle/10665/312342

World Health Organization (WHO). 2025. Global report on hypertension 2025: High stakes - turning evidence into action. Geneva: World Health Organization. Annex 1, Comoros country profile, p. 130. https://cdn.who.int/media/docs/default-source/country-profiles/hypertension/hypertension_country_profiles_2025.pdf.

Xiao X, Huang S, Yang Z, Zhu Y, Zhu L, Zhao Y, Bai J, Kim KH. 2024. *Momordica charantia* bioactive components: hypoglycemic and hypolipidemic benefits through gut health modulation. Journal of Medicinal Food 27(7). doi: 10.1089/jmf.2024.k.0037

Yarmohammadi F, Mehri S, Najafi N, Amoli SS, Hosseinzadeh H. 2021. The protective effect of *Azadirachta indica* (neem) against metabolic syndrome: A review. Iranian Journal of Basic Medical Sciences 24(3): 280. doi: 10.22038/ijbms.2021.48965.11218

Zubaidi SN, Mohd Nani H, Kamal MSA, Qayyum TA, Maarof S, Afzan A, Misnan NM, Hamezah HS, Baharum SN, Mediani A. 2023. *Annona muricata*: Comprehensive review on ethnomedicinal, phytochemistry, and pharmacological aspects. Life 13(2): 353. doi: 10.3390/life13020353