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KANO STATE COMMERCIAL BOTANICAL GARDENS: ETHNOBOTANICAL SURVEY OF MEDICINAL PLANTS GROWN THEREIN FOR THE TREATMENT OF VARIOUS HUMAN AILMENTS

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ABSTRACT

Kano state metropolis is rich in botanical gardens operated by non-governmental bodies which are mostly located along the roadside. Their services are not limited to buying and selling of ornamental plants but also growing medicinal plants for herbal medicine. This study was undertaken to identify medicinal plants in commercial botanical gardens of Kano metropolis as well as to document their medicinal practices by the inhabitants of the study area. Various botanical gardens were identified by snowball sampling and the respondents provided information via a semi-structured questionnaire. A total of 55 respondents participated in this study and most of them fall between the age of 21-30 years. They divulged the use of 53 medicinal plants in herbal medicine. The plants were reported to be used in the treatments 21 disease conditions including typhoid, malaria, hypertension, infection, pile, skin diseases etc. The plants with highest frequency index include *Mangifera indica*, *Psidium guajaba*, *Senna siamae*, *Eucalyptus camaldulensis*, *Dodonaea viscosa*, *Musa paradisiaca*, *Syzygium cumini*, *Moringa oleifera Lam*, *Carica papaya*, *Acalypha wilkesiana*, *Citrus limon* and *Terminalia catappa*. In addition, most of the medicinal plants in the gardens were found to be exotic plants (62%) and are grown for ornamental purposes (35 plants). Decoction and oral administration were the most mentioned method of preparation and administration respectively. Growing of our indigenous plants in the gardens is recommended for their conservation and sustainable development.

Keywords: Botanical gardens, Herbal medicine, Medicinal plants, Kano state metropolis

INTRODUCTION

Human beings have relied on plants for their basic needs throughout history, using it as a source of medicines, shelter, food, fragrances, clothing and flavors. For a significant portion of the global population, medicinal plants remain a central part of healthcare, especially in developing countries, where the use of herbal medicine has a long-standing tradition (Abubakar *et al*., 2022). The recognition and use of these plants for medicinal and economic purposes are growing in both developed and developing nations (Ahmad *et al*., 2017) Nigeria is home to a variety of indigenous plant species and has a long tradition of folk medicine, where various herbal remedies made from different parts of medicinal plants are used either as alternatives to or alongside with conventional medicine for treating a wide range of illnesses (Evbuomwan *et al*., 2023; Sani and Aliyu, 2024). Among the notable regions for plant cultivation and utilization in Nigeria is Kano State, located in the northern part of the country (Ali *et al*., 2017), known for its rich agricultural heritage and the presence of a diverse range of flora with therapeutic potential (Abdulrashid *et al*., 2019). The state also housed numerous botanical gardens, one of which is the Commercial Botanical Gardens. These gardens not only engage in buying and selling of ornamental plants but also cultivate medicinal plants for use in herbal medicine. It also serves as an educational and research center for plant conservation, and sustainable use.

Despite the growing interest in medicinal plants and the potential they offer for healthcare, there is a lack of comprehensive documentation regarding the species of medicinal plants cultivated in Kano State's Commercial Botanical Garden. Furthermore, there is limited knowledge about the specific ethnobotanical uses of these plants within the local communities. This research aims to fill this gap by conducting an ethnobotanical survey to identify and document the medicinal plants grown in the garden and to ascertain the efficacy as well as safety of some the plants scientifically.

MATERIALS AND METHODS

Study area

The current research was carried in Kano State metropolis, which is the core of Kano State north-western part of Nigeria (Abubakar *et al.*, 2022). The climate of the region is divided into dry season typically lasts from November to March and the rainy season which occurs from May to September. Commercial botanical gardens in Kano metropolis are distributed within the local governments area comprising the Kano state metropolis including Tarauni, Nassarawa, Gwale, Municipal, Kumbotso, Dala, Fagge. The gardens house both exotic and native plants for ornamental and other purposes and are predominantly situated at the backyard of government settlements along the roadside. The sections in the garden include the nursery section where plants are raised and the plant section where matured plants can be harvested for medicinal purposes.

Study population

Our study group includes gardeners from the botanical gardens of Kano state metropolis

Data collection

Ethnobotanical survey was carried out between June and August, 2024 by snow ball sampling and information on the use of medicinal plants was obtained using a semi structured questionnaire by an oral interview in the state native language (Hausa). The questionnaire consists of two sections, section for the particulars of the respondent and a section for the use of medicinal plants in the garden. After an interview a field work was conducted to observe and identify each plant mentioned by the respondent in the garden. On site identification of the plants was carried on the field using

identification tools including 'plant net' and 'picture this'. Digital images and fresh sample of the investigated plants were also taken and collected respectively for authentication by botanist.

Data analysis

Data collected was analyzed using descriptive statistic. Frequency index was calculated as described by Sulaiman *et al*. (2022) using the following formula;

(FI = FC/N×100)

Where,

FI = Frequency index

FC = Number of respondents citing the use of a species

N = Total number of the respondents

RESULTS AND DISCUSSION

Data of the respondents

Table 1 depicted demographic features of the respondents in the study area. Commercial botanical gardens in Kano state metropolis were found to be distributed within six local government areas (L.G.A's) out of the eight L.G.A's that make of the metropolis. Tarauni L.G.A was found to have higher number (24) of the gardens than the other L.G.A's. This might indicate that Tarauni is more favorable conditions for botanical cultivation or better market accessibility for medicinal plants. A total of 55 respondents were interview in the study area. The demographic data reveals that the respondents were all male, with the majority falling within the age range of 21-30 years (45%), and a significant proportion (82%) relying on gardening as their main source of income. These demographic insights suggest that commercial gardening, particularly medicinal plant cultivation, is seen as a viable livelihood, especially for younger men in the region. However, the challenges raised by respondents, including lack of space, water, and government support, point to significant barriers that limit the potential of these botanical gardens. These issues underscore the need for policies that support sustainable botanical garden development, including better infrastructure, government intervention, and the conservation of native plant species. Supporting these gardens would not only enhance local access to medicinal plants but also contribute to biodiversity conservation and sustainable resource use in the region. These findings align with global trends in small-scale farming and plant conservation, where resource limitations hinder agricultural productivity and sustainability (Elliott *et al*., 2017). The reliance on irrigation systems for cultivating medicinal plants, particularly during dry seasons, is indicative of the climatic challenges in Kano State, where water scarcity is a significant concern (Ahmed and Zubair, 2020).

Table 1: Demographic features of the respondents, 2024

Variable	Specification	Frequency (%)
LGA	Fagge	8 (15)
	Gwale	9 (16)
	Kumbotso	5 (9)
	Municipal	4 (7)
	Nassarawa	5 (9)
	Tarauni	24 (44)
Respondents	Male	55 (100)
	Female	0 (0)
Ages	10-20	7 (13)
	21-30	25 (45)
	31-40	10 (18)
	41-50	11 (20)
	51-60	2 (4)
Duration of practice	1-10	30 (55)
	11-20	20 (36)
	21-30	5 (9)
Occupation	gardener	55 (100)
	Others	0 (0)
Main source of income	Yes	45 (82)
	No	10 (18)
Method of cultivation	Irrigation	55 (100)
	Others	0 (0)
Any challenges	Lack of space	55 (100)
	Lack of water for irrigation	55 (100)
	Lack of government intervention	55 (100)

Table 2. showed a list of medicinal plants reported by the respondents that are used by the inhabitants of Kano state metropolis for the treatments of various human ailments. A total of 53 medicinal plants were reported by the respondents. The plants were distributed among 35 families with family euphorbiaceae having the highest number of plants (4) followed by annonaceae, lamiaceae, myrtaceae 3 each and remaining plants having 2 and 1 plant. The plants with the highest frequency of index includes; *Mangifera indica*, *Psidium guajaba*, *Senna siamae*, *Eucalyptus camaldulensis*, *Dodonaea viscosa*, *Musa paradisiaca*, *Syzygium cumini*, *Moringa oleifera Lam*, *Carica papaya*, *Acalypha wilkesiana*, *Citrus limon* and *Terminalia catappa*. Litereture search based on pharmacological activity of some of these plants confirm there antibacterial and anti-malarial activity (Becerra *et al*., 2023; Fajrih *et al*., 2022; Edet *et al*., 2023; Hannan *et al*., 2013; Stephen *et al*., 2015; Savan *et al*., 2019; Alozieuwa *et al*., 2022; Mohammad *et al*., 2017;Khurram *et al.,* 2009; Legba *et al*., 2020; Akporhuarho *et al*., 2020). strengthens the validity of traditional knowledge. The plants cultivated in the

garden are mostly grown in the form trees and shrubs. It was observed that leaves were the most mentioned plant parts by the respondents followed by stem (figure 1). The use of leaves as the most frequently mentioned plant part also aligns with common practices where plant leaves are primarily utilized for their medicinal properties. This preference could be due to the ease of access, abundance, and potency of bioactive compounds in the leaves (Tesch *et al*., 2015). Furthermore, the use of plants for multiple purposes—such as fruit, ornamental value, and medicinal uses—illustrates the multifunctional role that plants play in local economies and health systems. Interestingly, the plants listed are predominantly exotic species (62%) (figure 2) cultivated mainly for ornamental purposes (figure 3). This trend could reflect the growing global preference for exotic plants in horticulture and landscaping (Shinwari, 2010). However, it also raises concerns about the balance between native and exotic species in local plant conservation efforts.

Table 2: List of medicinal plants for the treatment of various human ailments in Kano State commercial botanical gardens, 2024

S/N	Botanical Name	Common/ Local Name (Hausa)	Family	Form	Part Used	Origin	Cultivation Purpose	FC	FI (%)
1	*Anacardium occidentale* L.	Cashew	Anacardiaceae	T	L	Exotic	Fruit	4	7.3
2	*Mangifera indica* L.	Mango / Mangoro	Anarcadiacae	T	L, S	Native	Fruit, shade, firewood	35	64
3	*Annona muricata* L.	Soursop /caf- caf	Annonacae	T	L, F	Exotic	Fruit	8	15
4	*Polyalthia longifolia* (Sonn.) Thwaites	Masquerade	Annonaceae	T	L, S	Exotic	Ornamental	14	25
5	*Annona squamosa* L.	Sweetsop/ Fasadabur	Annonaceae	T	L	Exotic	Fruit, ornamental	6	11
6	*Coriandrum sativum* L.	Coriander	Apiaceae	H	L	Exotic	Aromatic	2	4
7	*Calotropis procera* (Aiton) Dryand	Calotropis/Tumfafiya	Apocynaceae	S	L	Native	Fodder	2	4
8	*Phoenix dactylifera* L.	Date palm/Dabino	Arecaceaee	T	F	native	Fruit, Ornamental	3	5
9	*Artemisia annua* L.	/ sweet wormwood/ Tazargade	Asteraceae	H	W	Native	Ornamental	1	2
10	*Dracaena hyacinthoides*	Snake plant / Anti snake	Asparagaceae	W	L	Exotic	Ornamental	2	4
11	*Vernonia amygadalina* Delile	Bitter leaf/Shuwaka	Asteraceae	S	L	Native	Vegetable	4	7
12	*Carica papaya* L.	Pawpaw / Gwanda	Carricaceae	T	L	Native	Fruit	23	41
13	*Casuarina equiselifolia* L.	Whisiling pine/ kasarina	Casuarinaceae	T	L	Exotic	Ornamental	10	18
14	*Terminalia mantaly* H.Perrier	Terminalia/ satilyte	Combretaceae	T	L	Exotic	Ornamental, Shade	7	13
15	*Terminalia catappa* L.	Umbrella tree/ fruit	Combretaceae	T	L	Exotic	Ornamental, fruit	15	27
16	*Ipomoea batatas* (L.) Lam.	Sweet potato/ dankali	Convulvulaceae	TB	L	Native	Food	1	2
17	*Kalanchoe pinnata* (Lam.) Pers.	Life leaf / Komai da ruwanka	Crassulaceae	S	L	Exotic	Ornamental	8	15
18	*Jatropha curcas* L.	Barbados nut/ Bini da zugu	Ephorbiaceae	S	L, S	Native	Nil	5	9
19	*Acalypha wilkesiana* Mull.Arg.	Copperleaf	Euphorbiaceae	S	Fl	Exotic	Ornamental	20	36
20	*Cnidoscolus aconifotilius* (Mill.) I.M. Johnst.	Spinach tree/ Ogun	Euphorbiaceae	S	L	Native	vegetable	4	7
21	*Hura crepitans* L.	Sandbox tree / Durumin bature	Euphorbiceae	T	L	Exotic	Fruit, shade	4	7
22	*Senna siamae* (Lam.) H.S. Irwin &B arneby	Cassia/ Kasia	Fabaceae	T	L	Exotic	Ornamental	30	54
23	*Delonix regia (Hook.)* Raf.	Royal Poinciana/ Fanshana	Fabaceae	T	L	Exotic	Ornamental, shade	5	9
24	*Gmelina arborea Roxb.*	Gmelina	Lamiaceae	H	L	Exotic	Ornamental, fodder, timber	3	5
25	*Ocimum basilicum* L.	Basil /Daddoya	Lamiaceae	H	L	Native	Aromatic	5	9
26	*Mentha spicata* L.	Spearmint / Naanaa	Lamiaceae	H	L	Exotic	Ornamental, aromatic	11	20
27	*Persea americana* Mill.	Avocado /piya	Lauraceae	T	L	Exotic	Fruit	3	5
28	*Aloe vera* (L.) Burm.f.	Aloe vera	asphodelaceae	H	L	Exotic	Ornamental, cosmetic	10	18
29	*Punica granatum* L.	Pomegranate/Ruman	Lythraceae	T	L	Exotic	Ornamental, fruit	6	11
30	*Lawsonia inermis* L.	Henna tree/ Lalle	Lythraceae	S	L	Native	Fodder	2	4
31	*Hibiscus rosa-sinensis* L.	Chinese hibiscus	Malvaceae	S	L	Exotic	Ornamental	1	2

S/N	Botanical Name	Common/ Local Name (Hausa)	Family	Form	Part Used	Origin	Cultivation Purpose	FC	FI (%)
32	*Adansonia digitata* L.	African baobab/ Kuka	Malvaceae	T	L, R	Native	Vegetable, fruit	1	2
33	*Azadirachta indica* A. Juss.	Neam / darbejiya	Meliaceae	T	L	Native	Shade, firewood	13	24
34	*Ficus thonningii* Blum	Wild fig/ Chediya	Moraceae	T	L	Native	Firewood, shade, fodder	1	2
35	*Ficus Benjamina* L.	Yellow ficus tree	Moraceae	T	L	exotic	Ornamental	10	18
36	*Moringa oleifera* Lam.	Moringa/ Zogale	Moringaceae	T	L	Native	Vegetable	22	40
37	*Musa paradisiaca* L.	Banana /Ayaba	Musaceae	T	L, Fl	Native	Fruit	24	45
38	*Syzygium cumini* (L.) Skeels	Black plum/Malmo	Myrtaceae	T	L, S	Exotic	Fruit, shade, firewood and ornamental	20	36
39	*Psidium guajabal* L.	Guava / Goba	Myrtaceae	T	L	Native	Fruit	31	56
40	*Eucalyptus camaldulensis* subsp. obtusa (blakely) Brooker&M..W. McDonald	Eucalyptus/ Turare	Myrtaceae	T	L	Exotic	Ornamental	25	45
41	*Bougainvillea glabra* Choisy	Paper flower	Nyctaginaceae	C	Fl	Exotic	Ornamental	7	13
42	*Jasminum sambac* (L.) Aiton	Arabian jasmine	Oleaceae	S	L	Exotic	Ornamental	2	4
43	*Phyllanthus amarus* schumach. & Thonn.	Carryme seed/ stone breaker	phyllantaceae	H	L	Native	Ornamental	4	7
44	Cymbopogon citratus (DC.) Stapf	Lemon grass	Poaceae	H	L	Exotic	Aromatic/ Flavoring agent	11	20
45	*Rosa gallica* L.	French rose	Rosaceae	S	Fl	Exotic	Ornamental	3	5
46	*Morinda citrifolia* L.	Noni	Rubiaceae	S	L	Exotic	Ornamental	2	4
47	*Citrus sinensis* (L.) Osbeck	Sweet orange/ Lemon zaki	Rutaceae	T	L	Native	Fruit	12	22
48	*Citrus limon* (L.) Osbeck	Lemon / Lemon tsami	Rutaceae	T	L	Native	Fruit	17	31
49	*Dodonaea viscosa* (L.) Jacq.	Hopbush/ fil fil	Sapindaceae	S	L	Exotic	Ornamental	25	45
50	*Talinum fruticosum* (L.) juss	Water leaf	Talinaceae	H	L	Exotic	Ornamental	5	9
51	*Lantana camara* L.	Antimosquitor	verbenaceae	S	W	Exotic	Ornamental	4	7
52	*Duranta erecta* L.	Golden dewdrop/ Yellow bush	Verbenaceae	S	L	Exotic	Ornamental	15	27
53	*Vitis vinifera* L.	Wine grape	Vitaceae	C	F	Exotic	Fruit, Ornamental	3	5

Key: form; S/N = Serial number, T=tree, S = shrub, H= herb, TB= tuber, C= climbing shrub.
Plant part; L = leaves, S= stem, R = root, F = fruit, Fl = flower, W= whole plant
FC = Frequency of citation, FI = frequency index

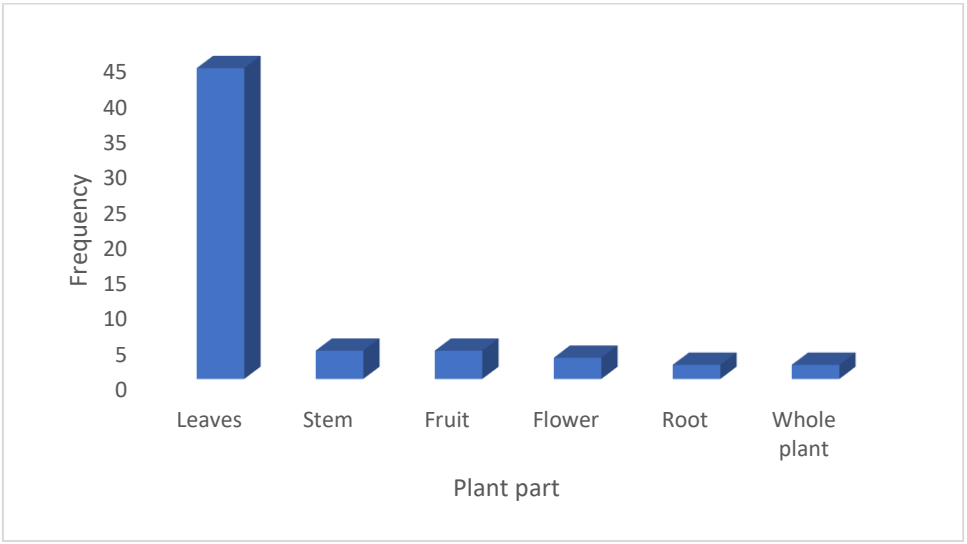

Figure 1: Parts of medicinal plant used in Kano State commercial botanical gardens, 2024

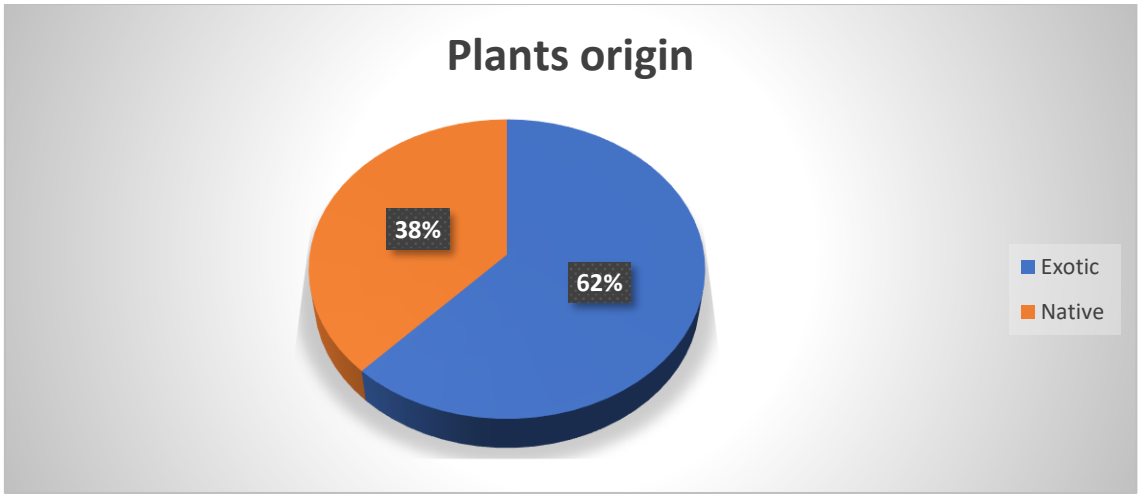

Figure 2: Origin of the medicinal plants used in Kano State commercial botanical gardens, 2024

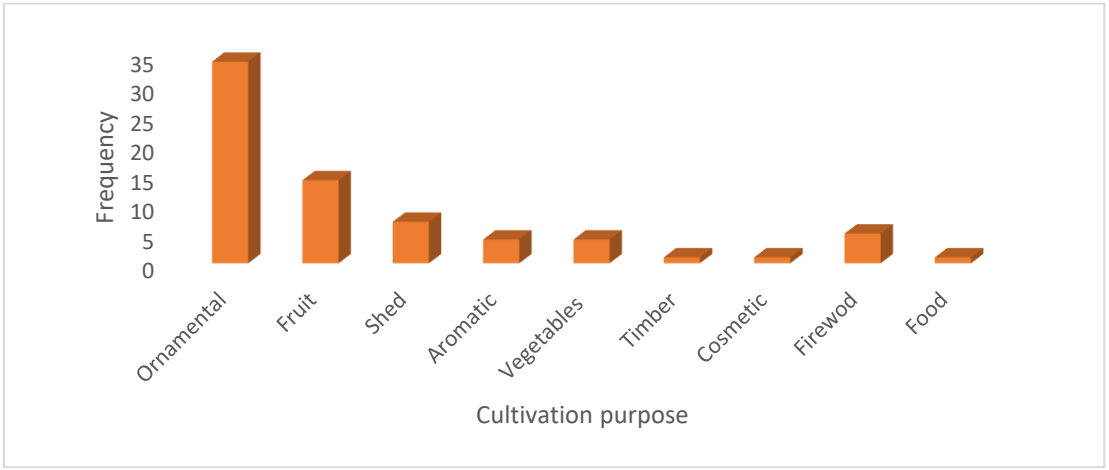

Figure 3: Cultivation purpose of Various medicinal plants in Kano State commercial botanical gardens, 2024

In terms of medicinal use, the plants identified are used to treat a variety of ailments, with typhoid and malaria being the most commonly mentioned disease conditions (figure 4). The widespread use of medicinal plants for these diseases is consistent with their commonality in tropical and subtropical regions (Asfaw and Tadesse, 2018). Decoction and oral administration have been the main method of preparation and administration of the investigated plants respectively (table 3). Moreover, the use of decoction and oral administration as the primary methods of preparation and administration further reflects traditional practices in the region, which are deeply rooted in local health care systems (Muller, 2007).

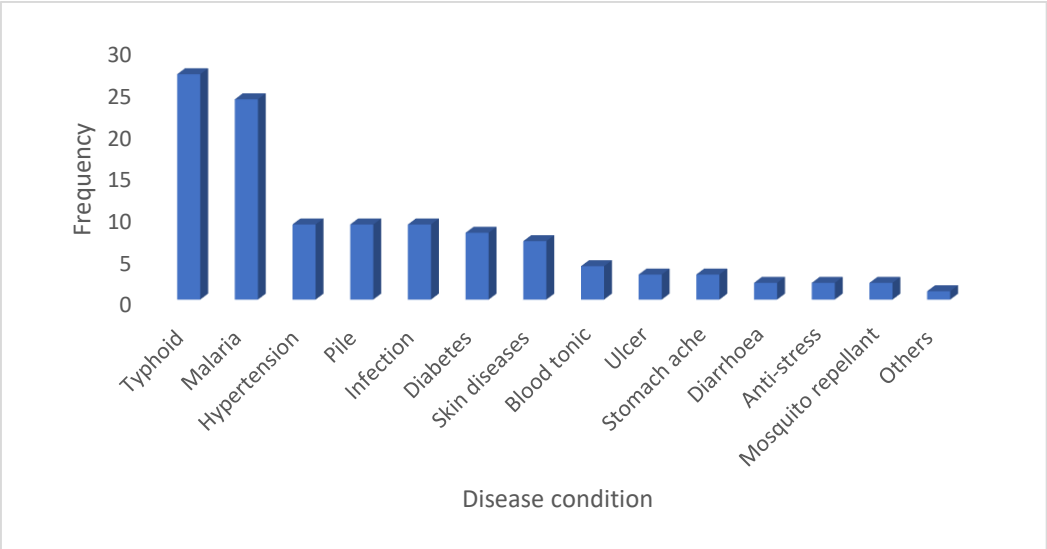

Figure 4: Disease conditions treated using medicinal plants in Kano State Commercial Botanical gardens, 2024

Table 3: Methods of preparations and mode of administrations of medicinal plants in Kano State commercial botanical gardens, 2024

S/N	Botanical Name	Medicinal Uses	Preparation	Administration
1	*Anacardium occidentale* L.	Stem is used for pile	Decoction	Oral/sit bath
2	*Mangifera indica* L.	Leaves are used for Malaria, typhoid, hypertension, stem is used for pile	Decoction	Oral
3	*Annona muricata* L.	Leaves are used for Diabetes, hypertension, malaria	Decoction	Oral/steaming
4	*Polyalthia longifolia* (Sonn.) Thwaites	Leaves are used for the treatment of Malaria, typhoid, pile Stem is used to treat infection	Decoction	Oral /steaming
5	*Annona squamosa* L.	For typhoid	Decoction	Oral /steaming
6	*Coriandrum sativum* L.	Anti-tress, laxative	Decoction	Oral
7	*Calotropis procera* (Aiton) Dryand	Leaves are used as analgesic	Decoction	Steaming
8	*Phoenix dactylifera* L.	Fruit is eaten for hypertension	Raw	Oral
9	*Artemisia annua* L.	Malaria, typhoid	Decoction	Oral
10	*Dracaena hyacinthoides*	Secretions from leaves is used for Snake bite	Crush	Topical
11	*Vernonia amygadalina* Delile	Leaves are used for diabetes, measles and other skin diseases	Cook / crush	Oral / topical
12	*Carica papaya* L.	Leaves are used for Malaria, typhoid, pile, stomach ache, cancer	Decoction	Oral
13	*Casuarina equiselifolia* L.	Leaves are used for malaria, typhoid	Decoction	Oral
14	*Terminalia mantaly* H.Perrier	Leaves are used for malaria, Stem is chew for tooth ache,	Decoction	Oral
15	*Terminalia catappa* L.	Leaves are used for Skin diseases, hypertension, malaria typhoid	Decoction	
16	*Ipomoea batatas* (L.) Lam.	Leaves powder is taken with milk for sickle cell anaemia	Powder	Oral
17	*Kalanchoe pinnata* (Lam.) Pers.	Secretion from leaves are used for ear ache, leaves are chew for stomach ache, hypertension, typhoid, leaves are also warmed and applied on feet for diabetes	Raw	Oral/ topical
18	*Jatropha curcas* L.	Leaves are used for malaria, blood clotting, the stem is chew for mouth ulcer	Decoction / crushing	Oral topical
19	*Acalypha wilkesiana* Mull.Arg.	Leaves are used for Skin disease-, malaria typhoid, hypertension, stomach ache	Decoction	Bath
20	*Cnidoscolus aconifotilius* (Mill.) I.M. Johnst.	Leaves are used for diabetes	Cook	Oral
21	*Hura crepitans* L.	Leaves are used for typhoid	Decoction	Oral
22	*Senna siamae* (Lam.) H.S.Irwin &B arneby	Leaves are used for Malaria, typhoid, pile	Decoction	Oral
23	*Delonix regia* (Hook.) Raf.	Leaves are used for malaria, typhoid	Decoction	Oral
24	*Gmelina arborea* Roxb.	Leaves are used for typhoid, pile	Decoction	Oral
25	*Ocimum basilicum* L.	For infection	Cook	Oral
26	Mentha spicata L.	Leaves are used for Infection, skin disease, as anti stress	Decoction	Oral
27	*Persea americana* Mill.	Leaves for malaria, fruit as blood tonic	Decoction /raw	Oral
28	*Aloe vera* (L.) Burm.f.	For skin diseases, infection, ulcer (chew in the morning with lemon	Raw	Oral
29	*Punica granatum* L.	Leaves are used for pile	Decoction	Sit bath
30	*Lawsonia inermis* L.	Leaves are used for infection	Decoction	oral/ sith bath
31	*Hibiscus rosa-sinensis* L.	Leaves are used for hypertension	Decoction	Oral
32	*Adansonia digitata* L.	Leaves are used for ulcer, roots are used for infection	Decoction / powder	Oral/ sit bath
33	*Azadirachta indica* A.Juss.	Leaves are used for Malaria, typhoid	Decoction	Oral
34	*Ficus thonningii* Blum	Leaves are used for typhoid	Decoction	Oral
35	*Ficus Benjamina* L.	Leaves are used for typhoid	Decoction	Oral
36	*Moringa oleifera* Lam.	Leaves are used for Hypertension, pile, malaria, typhoid, diabetes, as blood tonic, stem and root are used for infection	Decoction	Oral
37	*Musa paradisiaca* L.	Leaves are used for typhoid and bulb is used for hypertension, diabetes	Decoction	Oral
38	*Syzygium cumini* (L.) Skeels	Leaves are used for Typhoid, malaria, stem is used for infection	Decoction	Oral / steam
39	*Psidium guajabal* L.	Leaves are used for Malaria, typhoid, diarrhea, stomach discomfort, ulcer	Decoction	Oral/steaming
40	*Eucalyptus camaldulensis* subsp.obtusa (blakely) Brooker&M..W.McDonald	Leaves are used for Malaria, typhoid	Decoction	Oral/steaming
41	Bougainvillea glabra Choisy	flowers are used for typhoid, skin diseases, diarrhea.	Decoction	oral /bath
42	*Jasminum sambac* (L.) Aiton	Mosquito repellant	Drying	Fumes
43	*Phyllanthus amarus* schumach. & Thonn.	Malaria, typhoid, diabetes	Decoction	Oral

S/N	Botanical Name	Medicinal Uses	Preparation	Administration
44	*Cymbopogon citratus* (DC.) Stapf	Whole plant is used for Infection	Decoction	Oral
45	*Rosa gallica* L.	Leaves are used for skin diseases, is taken orally after maceration in water for pile	maceration/crush	oral/topical
46	*Morinda citrifolia* L.	Leaves are used for diabetes	Powder	Oral
47	*Citrus sinensis* (L.) Osbeck	Leaves are used for Malaria, typhoid	Decoction	Oral
48	*Citrus limon* (L.) Osbeck	Leaves are used for Malaria, typhoid	Decoction	Oral
49	*Dodonaea viscosa* (L.) Jacq.	Leaves are used for Malaria, typhoid	Decoction	Oral
50	*Talinum fruticosum* (L.) juss	Leaves as blood tonic	Cook	Oral
51	*Lantana camara* L.	Whole plant is used as Mosquito repellant	Raw	
52	*Duranta erecta* L.	Leaves are used for Malaria, typhoid, pile	Decoction	Oral
53	*Vitis vinifera* L.	Blood tonic	Raw	Oral

Key: - = not applicable

In general, this study indicates that a greater number of medicinal plants are obtained from commercial botanical gardens compared to those that are cultivated, irrespective of their medicinal significance to the population of Kano State, Nigeria. The cultivation of these species remains rudimentary, as large-scale production is not yet implemented. The proportion of these plants sourced from the wild and cultivated remains minimal. This indicates the unsustainable management of plant genetic resources in this region. Naranjo (1995) emphasized the critical necessity to investigate these medicinal plants, highlighting the significant neglect of this highly endangered yet cost-effective alternative healthcare resource. As numerous young individuals migrate from rural areas to urban centers, even minimal agricultural practices face increased neglect, while wild-sourced resources are jeopardized by gene erosion, anthropogenic activities, and environmental degradation. Unfortunately, few or no conservation measures are enacted to protect these plants. According to Herdberg and Herdberg (1992), understanding what to conserve is essential for determining a course of action. Currently, most of these genetic resources remain largely undocumented, and the indigenous knowledge regarding their significance is progressively diminishing. This results from either a lack of initiative in prevention or the minimal effort implemented, which is hindered by the typical delays associated with official bureaucracy. Obute and Osuji (2002) asserted that if no measures are taken to safeguard our environment, we will eventually awaken to the realization that it is too late to preserve what remains from the assault on nonrenewable resources, resulting in irrevocable loss.

The results underscore the necessity of reconciling traditional medicine practices with orthodox medicine, rather than the contempt with which the latter regards the former in this region. This is evident due to the interdependence of the two, as well as the fact that a significant number of individuals rely solely on it as their available healthcare service, given that orthodox options are inaccessible to them. Moreover, the conventional method frequently addresses certain conditions that have eluded contemporary medical practice. Ayodele (2005) urged Nigerian taxonomists and conservation biologists to effectively identify and preserve these vital genetic resources; we extend this imperative to all environmental stakeholders to act promptly before it is too late.

In addition to the direct traditional utility of these genetic resources, allopathic medicine is increasingly utilizing traditional medicines due to their cost-effectiveness and accessibility to a larger segment of the global population. It is anticipated that this initiative will inspire additional research, similar to practices in China and India, where modern medicine is regarded as complementary to traditional medicine, thereby improving healthcare access for the impoverished. Promoting the intentional cultivation of these rapidly diminishing plants by rural farmers, as suggested by Cunningham *et al.* (2002), may serve as an expedient method for initiating short-term conservation programs while awaiting the implementation of long-term policies typically rooted in legislation.

The people of Kano State, Nigeria, possess a rich tradition of folk medicine that requires systematic organization and formal integration into the conventional healthcare delivery system.

CONCLUSION

This study reveals the use of 53 medicinal plants in the treatment of various human ailments in commercial botanical garden of Kano state metropolis. Malaria and typhoid appeared to be the most mentioned disease conditions by the respondents. Although pharmacological evidence showed the potential activities of some of the investigated plants, there is need to further the research to fully ascertain their efficacy as well as safety for human consumption. In addition, most of the investigated plants were found to be exotic. Growing of our native plants is recommended for their conservation and sustainable use.

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REFERENCES

Abubakar, A.R., Sani, I.H., Chiroma, S.S., Malami, S. and Yaro, A.H. 2022. Ethno-botanical survey of medicinal plants used traditionally in the treatment of mental disorders in Kano, Nigeria. *Tropical journal of pharmaceutical research, 21(5),* 1009-1017. http://dx.doi.org/10.4314/tjpr.v21i5.15.

Ahmad, D.R., Shahnawaz, M. and Hassan Q. P. 2017. General overview of medicinal plants: A review. *The Journal of Pharmacology, 6(6),* 349-351.

Ahmed, A., and Zubair, S. 2020. Water Scarcity and its Impact on Agriculture in the Kano Region. *Journal of Agricultural and Environmental Sciences, 45*(2), 12-25.

Akporhuarho, A.A., Jonathan. A. and Ozege, C.C. 2020. Phytochemical Constituents, Antimalarial Efficacy, and Protective Effect of *Eucalyptus camaldulensis* Aqueous Leaf Extract in Plasmodium berghei-Infected Mice. *Prev. Nutr.*

Food Sci., 25(1), 58-64. https://doi.org/10.3746/pnf.2020.25.1.58

Ali, M., Diso, S.U., Minjibir, A.A., Sani, J.A., Nas, F.S. and Yahaya, A. 2017. Assessments of Medicinal Plants Used in Treatment of Various Ailments in Kano City, Nigeria. *Asian Journal of Biotechnology and Bioresource Technology, 2(4),* 1-11. https://doi.org/10.9734/AJB2T/2017/38844

Alozieuwa, U.B., Mann, A., Kabiru, A.Y., and Ogbadoyi, E.O. (2022). In vivo antimalarial efficacy of *Psidium guajava* leaf crude extract and fractions in Plasmodium berghei infected mice. *AROC in Natural Products Research, 2(1),* 28-37. https://doi.org/10.53858/arocnpr02012837

Asfaw, Z., and Tadesse, M. 2018. Ethnobotanical Study of Medicinal Plants in the Tropics. *African Journal of Plant Science, 12*(5), 57-68.

Ayodele, A.E. 2005. The medicinally important leafy vegetables of south western Nigeria. Conservation of medicinally important leafy vegetables in Nigeria. http://lwww.siu.edu/~ebl/leaflets/ayodele.htm

Becerra, J.J.L., Pinheiro, A.A.V., Dourado, D. 2023.Antimalarial potential of *Moringa oleifera* Lam. (Moringaceae): A review of the ethnomedicinal, pharmacological, toxicological, and phytochemical evidence. J Venom Anim Toxins Incl Trop Dis. 26;29: e20220079. https://doi.org/10.1590/1678-9199-JVATITD-2022-0079 . PMID: 37266375; PMCID: PMC10231345.

Cunningham, A.B., Ayuk, E. Franzel. S., Duguma, B. and Asanga, C. 2002. An economic evaluation of medicinal tree cultivation: *Prunus africana* in Cameroon. Peoples and Plants Working Paper 10, UNESCO, Paris.

Edet E. A., Okoroiwu, H., Edet, U.O., Amaechi, D., NelsoN, P.E., Uchenwa, M., Eseyin, O.A., Samuel, G., Ettah, L.A. and Obongha, O.A. 2023. Antimalarial activity of *Mangifera indica* aqueous extract in Plasmodium berghei's apicoplast. *Tropical Journal of Pharmaceutical Research, 22 (5),* 1007-1015. Available online at http://www.tjpr.org http://dx.doi.org/10.4314/tjpr.v22i5.11

Elliott, J., Hunter, J., and Roberts, B. 2017. Challenges in Small-Scale Agriculture: Resource Limitations and Policy Gaps. *Global Environmental Change, 47,* 180-191.

Evbuomwan, I.O., Stephen, A.O. and Oluba, O.M. 2023. Indigenous medicinal plants used in folk medicine for malaria treatment in Kwara State, Nigeria: an ethnobotanical study. *BMC Complementary Medicine and Therapies, 23(324)*

Fajrih N, Wiryawan KG, Sumiati, Syahpura SK, Winarsih W. 2022. Identification of bioactive compounds of banana corm (*Musa paradisiaca*) using GC-MS and its inhibitory effect against pathogenic bacteria. *BIODIVERSITAS, 2023(1),* 195-204. https://doi.org/10.13057/biodiv/d230125

Hannan, A., Asghar, S., Naeem, T., Ikram, M.U., Ahmed, I., Aneela, S. and Hussain, S. 2013. Antibacterial effect of mango (*Mangifera indica* Linn.) leaf extract against antibiotic sensitive and multi-drug resistant *Salmonella typhi*. *Pak. J. Pharm. Sci., 26(4),* 715-719

Herdberg, I. and Herdberg, O. 1992. Roles and limits of local herbaria in conservation Biology. In: Kapoor-Vijay, P. and White, J (eds). *Conservation Biology – A training manual for Biological Diversity and Genetic Resources.* The Commonwealth Science Council, Commonwealth Secretariat, London.

Khurram, M., Ali Khan, M., Hameed, A., Abbas, N., Qayum, A. and Inayat, H. 2009. Antibacterial Activities of *Dodonaea viscosa* using Contact Bioautography Technique. *Molecules, 14,* 1332-1341; https://doi.org/10.3390/molecules14031332

Legba, B. , Dougnon, V. , Agbankpe, J. , Fabiyi, K. , Lougbegnon, C. , Soha, A. , Ayena, C. , Deguenon, E. , Koudokpon, H. and Baba-Moussa, L. (2020) Assessment of Anti-Salmonella Activity of Aqueous and Ethanolic Extract of Senna siamae, Used in Traditional Management of Salmonellosis in Benin. *Pharmacology & Pharmacy,* 11, 226-234. https://doi.org/10.4236/pp.2020.119020

Mohammed, A. H., Na'inna, S. Z., Yusha'u, M., Salisu, B., Adamu, U. and Garba, S.A. 2016. In vitro Antibacterial Activity of *Psidium guajava* Leaves Extracts against Clinical Isolates of Salmonella specie. *UJMR, 2(1),* 1-5.

Muller, A. 2007. Traditional Medicine and the Use of Medicinal Plants in Africa. *African Journal of Traditional, Complementary, and Alternative Medicines,* 4(1), 30-39.

Naranjo, P. 1995. The Urgent need for the study of medicinal plants. In: *Ethnobotany: Evolution of a Discipline,* (eds.) Schultes, R.E. and Reis, S. von. Chapman & Hall, London.

Obute, G.C. and Osuji, L.C. 2002. Environmental Awareness and Dividends: A Scientific Discourse. *African Journal of Interdisciplinary Studies. 3(1),* 90 – 94.

Sani. S.B. and Aliyu, B.S. 2024. Therapeutic potential of ethanol extract of *Acacia nilotica* (L.) delile and *Anogeissus leiocarpus* (DC.) Guill & per in diabetic wound healing: Evidence from male Wister rat. FUDMA Journal of Sciences (FJS), 8(5), 117-123. Doi: https://doi.org/10.33003/fjs-2024-0805-2690.

Savan Donga, Jyoti Pande and Sumitra Chanda 2019. Pharmacognostic investigations on the seeds of *Carica papaya* L. *Journal of Pharmacognosy and Phytochemistry, 8(5),* 2185-219.

Shinwari, Z. K. 2010. Medicinal Plants Research in Pakistan: A Review. *Journal of Medicinal Plants Research, 4*(3), 161-176.

Sulaiman, A.N., Arzai, A.H. and Taura, D.W. 2022. Ethnobotanical survey: A comprehensive review of medicinal plants used in treatment of gastro intestinal diseases in Kano State, Nigeria. Phytomedicine Plus, 2:1-5. http://doi.org/10.1016/j.phyplu.2021.100180.

Tesch, J., Koeser, A., and Melton, L. 2015. Functional Role of Plant Parts in Medicinal Use. *Journal of Ethnobiology, 7*(2), 112-120.

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