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Phytochemical and Ethnobotanical Properties of Plant Species Grown in Home Gardens among Communities in Jema'a Local Government area of Kaduna State, Nigeria

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ABSTRACT
Home gardens in Jema'a Local Government Area of Kaduna State, Nigeria, serve as important reservoirs of plant biodiversity and traditional knowledge, providing communities with essential resources for food, medicine, and cultural practices. This study aimed to identify and document the diversity, frequency of use, and cultural significance of medicinal plants found in home gardens in Jema'a LGA, Kaduna State and assess the phytochemical properties of the most used medicinal species. Thirty respondents each from Gwong, Godogodo and Jema'a Central zones were purposively selected for the study. Frequency of Citation (FC), Cultural Importance Index of Informant (CII) and Informant Consensus Factor (ICF) of plant species were determined. Six plants most frequently used for medicinal purposes were screened for phytochemicals. Thirty-four plant families were found in home garden while plant 41 species belonging to 28 families were identified as medicinal plants with Rutaceae as the most utilized family. *Moringa oleifera* had the highest CII of 0.700 with 18 known diseases which were being used to treat itand was used by 63 respondents. *Mangifera indica* (0.633), *Azadirachta indica* (0.611), *Persea americana* (0.489), *Carica papaya* (0.456), *Eucalyptus calmadulensis* (0.367) with 57, 55, 44, 41 and 33 ailments they respectively treat. ICFranged between 1.00 and 0.23. Stomach pain was the most mentioned/treated (67) with 18 individual plants used for the treatment. Steroids, Terpenoids, Flavonoids, Tannins, Alkaloids and Phenolics were positive (++) in the six most medicinal plants. Most respondents (64%) acquired knowledge of medical plants from their tradition/cultural sources**;** believed plants cure diseases (93.2%); highly aware of home garden practices for medicinal purposes (41.6%). Also, most respondents (50%) claimed the State Government policy on providing seedlings helped in the establishment of home garden. Suggestions for promoting medicinal plant use included encouraging the planting of medicinal species (37.1%) and increasing public awareness of their importance (32.6%). The study concludes that home gardens in Jema'a LGA, Kaduna State, serve as important reservoirs of medicinal plant diversity and traditional knowledge, highlighting the need to promote their cultivation and public awareness to support local healthcare and cultural heritage.

Keywords:
Home garden,
medicine,
disease,
plants.

INTRODUCTION

Home gardens in Jema'a Local Government Area (LGA) of Kaduna State play a vital role in sustaining local health and livelihoods by providing a diverse array of plant species used for food, medicine, and cultural practices (Peter *et al.*, 2023). However, there is limited scientific documentation on the phytochemical constituents and ethnobotanical uses of these plants within the communities. This study aims to bridge that gap by Systematically identifying and analyzing the phytochemical and ethnobotanical properties of plant species cultivated in home gardens across Jema'a LGA, thereby supporting the preservation of indigenous knowledge and promoting sustainable utilization of local plant resources.

Home gardens play a significant role in preserving plant diversity and traditional knowledge across various cultures. Home gardens in Nigeria play a

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significant role in enhancing food security, biodiversity, and household well-being. There are diverse ecosystems that harbor a wide variety of plant species, serving multiple purposes for households (Galhena *et al*., 2013; Maredia *et al*., 2023). Studies have documented significant plant diversity in home gardens across different regions:In Benin, a study of 360 home gardens found they contained 14.21% of the country's plant species and 44.32% of plant families (Gbedomon *et al*., 2017). A survey in Bulgaria recorded 145 cultivated and semi-cultivated plant taxa used for food, medicine, and other purposes (Ivanova *et al*., 2021). The Batak Karo sub-ethnic group in North Sumatra, Indonesia maintained 85 species from 43 families in their home gardens (Silalahi & Nisyawati, 2018).

Studies have shown that these gardens contain a wide array of plant species used for multiple purposes, including food, medicine, and ornamental value (Ganesan *et al*., 2019; Silalahi & Nisyawati, 2018; Vlkova *et al*., 2010). In Indonesia, a study of Batak Karo sub-ethnic home gardens revealed 85 plant species from 43 families, used for both edible and medicinal purposes (Silalahi & Nisyawati, 2018). Similarly, in Vietnam, 67 species from 35 families were identified in home gardens, with the majority used for food (86%) and medicine (32%) (Vlkova *et al*., 2010). In Malaysia, 127 plant species belonging to 55 families were recorded in home gardens, with Euphorbiaceae being the most represented family (Ganesan *et al*., 2019).

Interestingly, the composition of home garden plants seems to be influenced by various factors. In Argentina, a study found that rural, semi-rural, and urban areas had similar species composition, suggesting a "core repertoire" of medicinal plants and widespread exchange among local populations (Furlan *et al*., 2016). However, in Vietnam, the diversity of home gardens was found to be lower compared to other tropical regions, possibly due to market-oriented strategies (Vlkova *et al*., 2010). Common food and medicinal plants found in these home gardens include Musa species, *Vernonia amygdalina*, citrus species, *Psidium guajava*, and *Terminalia catalpa catapa* (Aworinde*et al*., 2013). The plants serve multiple purposes, including alimentary, medicinal, ornamental, cosmetic, and ceremonial uses. Interestingly, some plants are used for treating specific ailments, such as malaria. A study in southwestern Nigeria identified 22 plant species from 18 families used for malaria treatment, with *Azadirachta indica*, *Alstoniacongensis*, and *Cymbopogon citratus* being the most frequently encountered (Dike *et al*., 2012).

While there is no specific information about home gardens in Jema'a LGA of Kaduna State, there are small-scale farming activities that are prevalent, with maize and cowpea being important crops (Ibrahim, 2007; Yusuf *et al*., 2015). The area also has a significant presence of swine farmers, predominantly women of active age (Duniya, 2013). These agricultural activities suggest that home gardening could be a viable option for improving food security and nutrition in the area. Therefore, this study aims to investigate the phytochemical and ethnobotanical properties of plant species grown in home gardens among communities in Jema'a LGA of Kaduna State, Nigeria.

MATERIALS AND METHODS

Study Area: Jema'a Local Government Area

Jema'a Local Government Area (LGA) is situated in the southern part of Kaduna State, Nigeria, with its Headquarters in Kafanchan. According to the 2006 census, the area has a population of 278,202 and a population density of 271.41 persons per km². The LGA is predominantly inhabited by the Gwong, Nkyob, Fantswam, and Nyaskpa ethnic groups, alongside others such as the Nindem, Atyap, Bajju, and Hausa tribes (Ali and Ahmed, 2020). The residents are primarily farmers, growing cash crops such aspeanuts and ginger, as well as staple foods such as corn, millet, sorghum, rice, vegetables, and cocoyam in large quantities. Geographically, Jema'a spans a landmass of 1,384 km², lying between latitudes 9°11'N and 9°30'N and longitudes 8°00'E and 8°30'E. It shares borders with Plateau State to the east, Nasarawa State to the south, and four LGAs: Zango Kataf to the north, Jaba to the west, Sanga to the south, and Kaura to the northeast. The area experiences two distinct seasons: wet and dry with an average temperature of 32°C (Magaji and Shat, 2019).

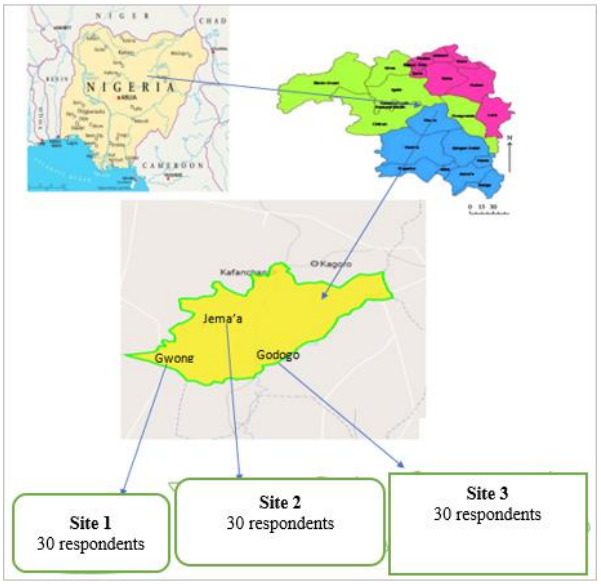

Figure 1: Sample sites of home gardens in three political zones of Jema`LGA of Kaduna State

Sampling Techniques

Three political zones of Jema'a LGA namely: Gwong, Godogodo, and Jema'a Central were purposefully selected for the study. A total of 90 households with home gardens, 30 from each zone, were surveyed. Data collection employed semi-structured questionnaires, focusing on respondents with home gardens who willingly participated. The study prioritized confidentiality and allowed respondents to freely express their views, minimizing bias and enhancing data quality. Interviews were conducted individually in English and Hausa, with the latter improving reliability by fostering comfort among non-English speakers. This approach ensured inclusivity and accuracy in capturing ethnobotanical insights across the selected zones.

Phytochemical Screening

Phytochemical screening was carried out on all the extracts according to methods reported by (Odebiyi and Sofowora (1978); Hörner and Klüfers (2016).

Quantitative analysis of data

Quantitative analysis of data collected was determined by the following:

i. Informant Consensus Factor (FIC)

Informant Consensus Factoris used for the ailment categories; it is a measure of the agreement among informants/collaborators that the plants species can treat a disease category.

$$FIC = (Nur - Nt)/(Nur - 1) \quad (1)$$

where:

Nur = number of use-reports for a particular disease category and

Nt = Total number of plants mentioned by all informants/collaborators for the disease category.

ii. **Cultural Importance Index (CII) –**

It is a measure of the importance of a particular plant species to the community. It is derived by dividing the number of separate uses recorded for a plant species by the total number of informants/collaborators.

$$CII = NUR/TNI \quad (2)$$

RESULTS AND DISCUSSION

Results

***Plant species use and their Cultural Importance Index in home gardens in** Jema'a*

Table 1 present results on identifying 44 distinct plant species, ranked by their ability to treat diseases, frequency of mention by respondents, and their Cultural Importance Index (CII). Highly valued species, such as Moringa oleifera, Mangifera indica, and Azadirachta indica, exhibited high Cultural Importance Index (CII) values of 0.700, 0.633, and 0.611, respectivelydue to their wide application in disease treatment and high mention frequency. Lesser-used species, such as *Blighia sapida* and *Brassica oleracea*, had lower indices of 0.022, reflecting minimal cultural and medicinal use.

***Frequency and percentages of familiesof all plant species found in** Jema'a LGA*

Table 2 presents catalogue plant species families in Jema'a LGA, identifying 34 families comprising 57 individual species. The Fabaceae and Rutaceae families were the most prominent, each contributing 7.02% of the species. Families such as Malvaceae, Myrtaceae, Arecaceae, and Lamiaceae had three species each, representing 5.26%. Anacardiaceae, Euphorbiaceae, and Musaceae, among others, contributed two species per family, equating to 3.51% each. Meanwhile, 19 families, including Amaranthaceae, Apocynaceae, and Asteraceae, were represented by a single species, accounting for 1.75% each. This diverse distribution highlights the ecological richness and ethnobotanical importance of the region, emphasizing the necessity for biodiversity conservation and sustainable utilization.

Table 1: Plant species Use and their Cultural Importance Index in home gardensin Jema'a

S/No.	Tree species	Number of diseases treated by a single species	Frequency of mention by respondents for each disease treated	Cultural Importance Index (CII)
1.	*Moringa oleifera*	18	63	0.700
2.	*Mangifera indica* (Mango)	19	57	0.633
3.	*Azadirachta indica* (Neem)	13	55	0.611
4.	*Persea americana* (Avocado)	13	44	0.489
5.	*Carica papaya* (Pawpaw)	21	41	0.456
6.	*Eucalyptus calmadulensis*	13	33	0.367
7.	*Khaya senegalensis* (Mahogany)	13	31	0.344
8.	*Ocimum gratissimum*(Scent leave)	11	29	0.322
9.	*Annona muricate* (Soursop)	11	29	0.322
10.	*Musa sapientum*(Banana)	9	26	0.289
11.	*Parkia biglobosa*(Locust bean)	13	25	0.278

12.	*Curcuma longa* (Turmeric)	11	25	0.278
13.	*Calotropis procera* (Sodom Apple)	7	23	0.256
14.	*Psidium guajava* (Guava)	13	21	0.233
15.	*Aloe barbadensis*	11	21	0.233
16.	*Vernonia amygdalina* (Bitter leaves)	10	20	0.222
17.	*Tamarindus indica* (Tamarind)	10	19	0.211
18.	*Citrus limon* (Lemon)	6	19	0.211
19.	*Adansonia digitate* (Baobab tree)	10	17	0.189
20.	*Anacardium occidentale* (Cashew)	8	14	0.156
21.	*Zingiber officinale* (Ginger)	9	13	0.144
22.	*Cocos nucifera* (Coconut)	10	12	0.133
23.	*Cymbopogon citratus* (Lemon grass)	5	12	0.133
24.	*Newbouldia laevis* (Boundary Tree)	10	11	0.122
25.	*Cactus sp.*	8	10	0.111
26.	*Amaranthus cruentus*	5	8	0.089
27.	*Citrus sinensis* (Sweet orange)	5	8	0.089
28.	*Acacia nilotica*	7	7	0.078
29.	*Morindacitrifolia*(Noni)	6	7	0.078
30.	*Cucurbita moschata* (Pumpkin)	6	6	0.067
31.	*Canarium schweinfurthii* (Elemi)	6	6	0.067
32.	*Jathropha sp.*	3	6	0.067
33.	*Saccharum officinarum* (Sugarcane)	3	5	0.056
34.	*Erythrina senegalensis*	4	4	0.044
35.	*Solanum melongena* (Garden egg)	3	3	0.033
36.	*Vitex negundo* (Chaste tree)	3	3	0.033
37.	*Citrus aurantiifolia*(Lime)	3	3	0.033
38.	*Blighia sapida*(Ackee)	2	2	0.022
39.	*Brassica oleracea* (Cabbage)	2	2	0.022
40.	*Colocasia esculenta* (Cocoyam)	2	2	0.022
41.	*Citrus paradisi* (Grape fruit)	2	2	0.022
42.	*Musa paradisiaca* (Plantain)	2	2	0.022
43.	*Capsicum annuum* (Sweet pepper)	2	2	0.022
44.	*Terminalia catappa*(Indian almond)	1	1	0.011

Table 2: Frequency and percentages of families' plant species found in Jema'a LGA

S/No.	Plant Family	Number of individual species	Percentage (%)
1.	Fabaceae	4	7.02
2.	Rutaceae	4	7.02
3.	Malvaceae	3	5.26
4.	Myrtaceae	3	5.26
5.	Arecaceae	3	5.26
6.	Lamiaceae	3	5.26
7.	Anacardiaceae	2	3.51
8.	Euphorbiaceae	2	3.51
9.	Musaceae	2	3.51
10.	Lauraceae	2	3.51
11.	Annonaceae	2	3.51
12.	Zingiberaceae	2	3.51

13.	Meliaceae	2	3.51
14.	Poaceae	2	3.51
15.	Solanaceae	2	3.51
16.	Amaranthaceae	1	1.75
17.	Apocynaceae	1	1.75
18.	Rubiaceae	1	1.75
19.	Caricaceae	1	1.75
20.	Asteraceae	1	1.75
21.	Combretaceae	1	1.75
22.	Alliaceae	1	1.75
23.	Cucurbitaceae	1	1.75
24.	Cactaceae	1	1.75
25.	Verbenaceae	1	1.75
26.	Leguminosae	1	1.75
27.	Brassicaceae	1	1.75
28.	Moringaceae	1	1.75
29.	Liliaceae	1	1.75
30.	Bignoniaceae	1	1.75
31.	Araceae	1	1.75
32.	Burseraceae	1	1.75
33.	Portulacaceae	1	1.75
34.	Apiaceae	1	1.75
Total	**34**	**57**	**100.00**

Results of phytochemical screening of sixmost utilized plant species in home gardens in Jema'a

The results of phytochemical screening (Table 3) showed that Steroids and Terpenoids were positive (++) in *Moringa oleifera, Mangifera indica* leaf and bark, *Azadirachta indica, Carica papaya* seed and leaf and *Eucalyptus calmadulensis* leaf. Tannins and Flavonoids were positive (++) in *Moringa oleifera* and *Mangifera indica* leaf and bark while only Flavonoidstested positive (++) in *Azadirachta indica* leaf. Saponins was onlypositive (++) in *Mangifera indica* stem bark. Alkaloids was solely positive (++) in *Moringa oleifera, Mangifera indica* leaf and bark, and *Azadirachta indica*. Phenolics was positive (++) in *Moringa oleifera* leaf, *Carica papaya* seed and leaf and *Eucalyptus calmadulensis* leaf. Cardial glycosides was trace (+) in *Moringa oleifera, Mangifera indica* leaf and bark, *Azadirachta indica, Carica papaya* seed and negative (-) in *Carica papaya* and *Eucalyptus calmadulensis*leaves. *Mangifera indica* bark was positive (++) five (5) phytochemicals: Steroids, Terpenoids, Tannins, Flavonoids, Saponins while it was trace (+) in Phenolics andCardial glycosides.

Table 3: Phytochemical screening results of six most utilized plant species in Jema'a LGA

S/No.	Plant name	T	Sp	St	F	A	P	Cg	T
1.	*Moringa oleifera* leaf	++	+	++	++	+	++	+	++
2.	Avocado leaf	++	+	++	++	+	+	+	++
3.	*Mangifera indica* leaf	++	+	++	++	++	+	+	++
	Mangifera indica bark	++	++	++	++	+ +	+	+	++
4.	*Azadirachta indica* leaf	+	+	++	++	++	+	+	++
5.	*Carica papaya* seed	+	+	++	+	+	++	+	++
	Carica papaya leaf	+	+	++	+	+	++	-	++
6.	*Eucalyptus calmadulensis* leaf	+	+	++	+	+	++	-	++

Key: T – Tannins, Sp –Saponins, St – Steroids, F – Flavonoids, A – Alkaloids, P – Phenolics, Cg - Cardial glycosides, T – Terpenoids, ++ = *positive;* + = *trace;* - = *negative*

Sources of information on the identification of medicinal plant species planted in home gardens in **Jema'a LGA**

Respondents acquired knowledge and information on medical plants and their identification from various means (Figure 1). Most (64%) respondents acquired

their knowledge of medical plants from their tradition/cultural sources while others from television (16.9%), newspapers and radio programmes (12.4%), respectively; and village head office (2.2%). On identification of medicinal plants, majority of respondents (52.5%) obtained their skills from traditional herbalist/healers whereas others gained their knowledge from grandparents (26.7%), immediate parents (10%), research books and articles (8.9%), university botanical garden 3.3%) and seminar (1.1%).

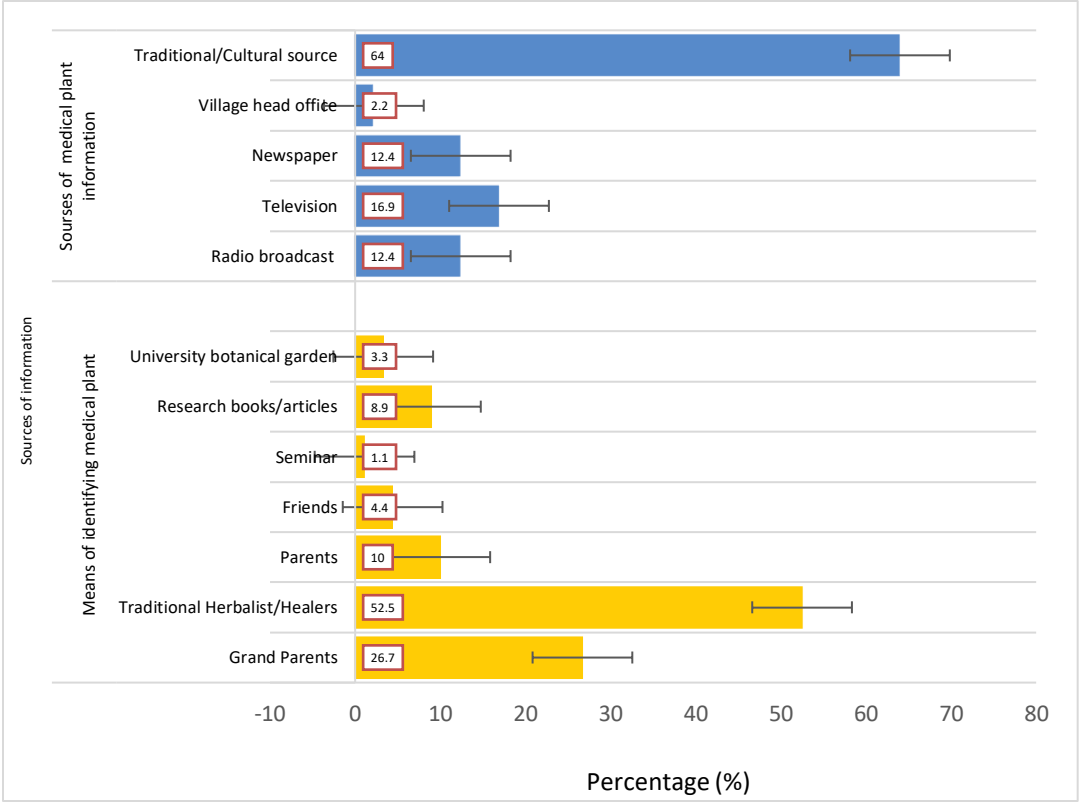

Figure 2: Sources information on identification of medicinal plant species planted in home gardens in **Gardens in Jema'a LGA**

Knowledge of perceived uses of plants in Jema'a **and from Home Garden**

Results on general knowledge of perceived plant use and uses of plants from home garden in Jema'a are presented in Figure 2. Generally, the majority of respondents (93.2%) believed plants cure diseases, while few others noted that plants were used to prevent diseases (21.6%) and promote human health (5.7%). Similarly, most respondents (94.3%) claimed plants in home garden were used for medicine, while some believed they were used as fruits (26.1%), windbreak or shelter belt (17%), and woodlots (12.5%).

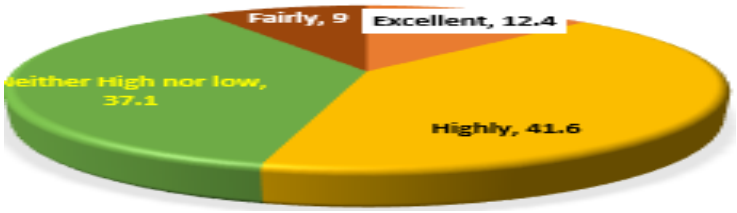

Figure 3: Respondent's awareness of planting medicinal plants in home garden in Jema'a LGA

Plant species uses by ailment and information consensus factor

Informant Consensus Factor (Fic) is a measure of the agreement among informants or collaborators that the plants species can treat a disease category. In this study (Table 4) the values ranged between 1.00 and 0.23 with apollo, stress relief, syphilis, tooth aches, eye disorder, nausea, snake bite and hemorrhage ailments, respectively having the highest value of 1.00. Stomach pain ailment was the most mentioned (67 out of 90 respondents) ailment with 18 individual plants used for the treatment. This is closely followed by Malaria fever (59 out of 90 respondents) with 16 plants used for its treatment; Diarrhea (47 out of 90 respondents) with 21 plants used for the treatment and Heart disease/problem (46 out of 90 respondents) having 16 plant species used for the treatment among others.Stomach pain ailment was the most treated disease with herbal medicine in the study area as reported by 67 respondents with 18 different plants claimed to be used for the purpose. This was followed by malaria fever reported by 59 respondents with 16 plants associated and diarrhea reported by 47 respondents with 21 linked plant species (Table 4).

Table 4: Frequency of use of Plant species in home gardens of Jama'a LGA by ailment and information consensus factor

S/No.	Disease treated	Number of respondents that reported use (Nur)	Number of species used for treatment (Nt)	Informant Consensus Factor (Fic)
1.	Apollo	5	1	1.00
2.	Stress relief	4	1	1.00
3.	Syphilis	3	1	1.00
4.	Tooth aches	3	1	1.00
5.	Eye disorder	2	1	1.00
6.	Nausea	2	1	1.00
7.	Snake bite	2	1	1.00
8.	Hemorrhage	2	1	1.00
9.	Depression	5	2	0.75
10.	Stomach pain	67	18	0.74
11.	Malaria fever	59	16	0.74
12.	Cold and catarrh	28	9	0.70
13.	Heart disease/problem	46	16	0.67
14.	Hypertension	19	7	0.67
15.	Bronchitis	4	2	0.67
16.	Constipation	9	4	0.63
17.	Arthritis/ Rheumatoid arthritis/Rheumatism	22	9	0.62
18.	Diabetes	39	16	0.61
19.	Cough	24	10	0.61
20.	Intestinal/stomach Ulcer	26	11	0.60
21.	Hepatitis	18	8	0.59
22.	Diarrhea	47	21	0.57
23.	Typhoid fever	40	18	0.56
24.	Cholesterol reduction	19	9	0.56
25.	Bladder/Kidney stones	10	5	0.56
26.	Tooth ache/pain	12	6	0.55
27.	Blood pressure reduction	23	12	0.50
28.	Asthma	13	7	0.50
29.	Skin problem/infection	7	4	0.50
30.	Vomiting	7	4	0.50
31.	Obesity reduction	5	3	0.50
32.	Menstrual pains	3	2	0.50
33.	Joint pain	3	2	0.50
34.	Cancer	30	16	0.48
35.	Yellow fever	14	8	0.46
36.	Liver disorder	9	6	0.38
37.	Dysentery	15	10	0.36

38.	Parasitic worms	12	8	0.36
39.	Infectious disease	10	7	0.33
40.	Headache	4	3	0.33
41.	Sexual transmission diseases	4	3	0.33
42.	Body weakness	4	3	0.33
43.	Pile	14	11	0.23
44.	Blood sugar reduction	7	7	0.00
45.	Swelling of throat and mouth	2	2	0.00
46.	Anemia	2	2	0.00
47.	Inflammatory disease	2	2	0.00
48.	Boost immunity	2	2	0.00
49.	Wound healing	2	2	0.00
50.	Sinusitis	2	2	0.00
51.	Sore throat	2	2	0.00
52.	Convulsion	2	2	0.00
53.	Viral infection	1	1	0.00
54.	Hookworm	1	1	0.00
55.	Hernia	1	1	0.00
56.	Jedi-jedi	1	1	0.00
57.	Pimples healing	1	1	0.00
58.	Pregnancy improvement	1	1	0.00
59.	Chills	1	1	0.00
60.	Digestive disorder	1	1	0.00
61.	Boil	1	1	0.00
62.	Migraines	1	1	0.00
63.	Stroke healing	1	1	0.00
64.	Improved weak rection	1	1	0.00
65.	Anxiety	1	1	0.00
66.	Body pain	1	1	0.00
67.	Epilepsy	1	1	0.00
68.	Fibroid	1	1	0.00
69.	Cholera	1	1	0.00
70.	Gall bladder	1	1	0.00
71.	Sickle cell disease	1	1	0.00
72.	Virginal infection	1	1	0.00
73.	Parasitic infection	2	2	0.00

Respondents' suggestions on ways to improve medicinal plants use and availability in Home Gardens in Jema'a LGA

Respondents suggested some ways to improve home garden in Jema'a LGA (Table 6) as the planting of medicinal plants should be encouraged (37.1%), public enlightenment of the importance of medicinal plants should be done (32.6%), conservation of medicinal plants both in ix-situ/in-situ practices (25.8%), avoidance of deforestation (22.5%) and avoidance of bush burning (13.5%). Others suggestions include: provision of quality seedlings and protection (fencing) of medicinal plants in home gardens with 9%; respectively. Also, that good market/exportation for medicinal plant should be provided (5.6%); mass seeding production to be encouraged (4.5); cutting of medicinal trees should stopped and Government should provide alternative to wood energy (2.2%), respectively. One respondent each (1.1%) suggested that identification and protection of medicinal plants should be done; tree planting campaign should be encouraged; medicinal plants should be stored and proper utilization of medicinal plants should be advocated.

Table 6: Respondents' suggested ways to improve medicinal plants use and availability in Home Gardens in Jema'a LGA

S/No.	Ways to Improve medicinal plants use and availability	Frequency	Percentage (%)
1.	Planting of medicinal plants should be encouraged	33	37.1
2.	Public enlightenment of the importance of medicinal plants	29	32.6
3.	Conservation of medicinal plants Ex-situ/in-situ	23	25.8
4.	Avoidance of deforestation	20	22.5
5.	Avoidance of bush burning	12	13.5
6.	Provision quality seedlings	8	9
7.	Protection (fencing) of medicinal plants in home gardens	8	9
8.	Good market/exportation for medicinal plant should be provided	5	5.6
9.	Mass seeding production	4	4.5
10.	Cutting of medicinal trees should stopped	2	2.2
11.	Government should provide alternative to wood energy	2	2.2
12.	identification and Protection of medicinal plants	1	1.1
13.	Tree planting campaign	1	1.1
14.	Storage of medicinal plants	1	1.1
15.	Proper utilization of medicinal plants	1	1.1

A. *Psidium guajava* (Guava)

B. *Moringa oleifera*

C. *Mangifera indica* (Mango)

D. *Persea americana* (Avocado Pear)

E. *Carica papaya* (Pawpaw)

F. *Vernonia amygdalina* (Bitter leaves)

G. *Eucalyptus calmadulensis*

H. *Annona muricate* (Soursop)

I. *Adansonia digitate* (Baobab tree)

J.*Azadirachta indica* (Neem)

***K. Ocimum gratissimum*(Scent leave)**

L. *Khaya senegalensis* (Mahogany)

Plate 1: Photographs of some of the plant species Sighted in Home Garden in Jema'a LGA

Discussion

A total of 41 species belonging to 28 families were identified as plants used for medicinal purposes in Jema'a LGA with Rutaceaeas the most utilized family with four individual species viz: *Citrus limon, Citrus sinensis, Citrus paradise* and *Citrus aurantiifolia.* Panda *et al.*, (2019) reported Rutaceae astraditionally and conventionally known to be popular in ethno-medicine. They also noted that most species in this family consist of several phytoconstituents that are the essential elements in the therapeutic value. Other important families of medicinal value include: Anacardiaceae with three individual species followed by Euphorbiaceae, Fabaceae, Meliaceae, Myrtaceae, Poaceae, Solanaceae and Zingiberaceae with two individual species each.*Azadirachta indica* (Meliaceae) had the highest Frequency Citation (FC) and Relative frequency citation (RFC) followed by *Moringa oleifera Mangifera indica, Persea americana, Carica papaya, Eucalyptus calmadulensis*and *Khaya senegalensis.* RFC gives an impression of the utmost used plant species in a community.

Informant Consensus Factor (Fic) refers to a quantitative analysis determined to give an idea of the compromise among informants or respondents that a plant or group of plant species can cure a particular disease category (Mukaila *et al.*, 2021). In this study, there was high values of Fic which ranged between 1.00 and 0.00. This implies that there is a high likelihood that the identified plants can treat the respective diseases mentioned. It might also suggest that the medicinal information or knowledge has been obtained and passed from a single source which leads to consistency in the information provided by respondents. Mukaila *et al.*, 2021). Noted that *F*ic can be influenced by large sample size. According to them, there is a high possibility of obtaining repetitive information when the sample size is above 50 respondents which they said repeated information could drive *F*ic values close to 1. Pradhan and Panda (2016) reported Fic values that ranged between 0.60

and 1.00 while (Mukaila *et al.*, 2021) obtained 0.96 to 1.00 from their study while Hossain and Rahman (2018) reported Fic value of 0.622 to 0.951. The disparity in the values of Fic could be the accessibility and diversity of medicinal plant species and its related knowledge in an area, restriction in exchange of ethnobotanical knowledge from one generation to another and one locality to other. Hossain and Rahman (2018) noted that low value of FIC may be due to a lack of communication among people in different areas.

Moringa oleifera had the highest Cultural Importance Index (CII) of 0.700 with 18 known diseases supposedly treated by it and was reported by 63 respondents. Other plant species with CII in this study were *Mangifera indica*, *Azadirachta indica*, *Persea Americana*, *Carica papaya* and *Eucalyptus calmadulensis.* High values of CII of any plant species is an indicator of potential overexploitation of the plant. It implies that *Moringa oleifera* was the most exploited plant for medicinal plant in Jema'a LGA. These plants with CII are expected to be preserved to avoid being threatened in the nearest feature in the study area. *Moringa oleifera* is one of the most used plant species for medicinal purposes. Farooq *et al.,* (2021) reported the use of *M. oleifera as* anti-inflammatory, antimicrobial, antioxidant, anticancer, cardiovascular, hepatoprotective, anti-ulcer, diuretic, antiurolithiatic, and antihelmintic.

Steroids, Terpenoids, Flavonoids**,** Tannins, Alkaloids and Phenolics were positive (++) in the most medicinal plants in Jema'a LGA. Agidew (2022) noted that the exceptional biological activity of plants can be identified by their phytochemical features. According to Tamokou *et al.*, (2017), Alkaloids possess good antibacterial and antifungal properties. Flavonoids are known to be synthesized by plants in defense against microbial infection. Tannins are reported to be mostly used in tanning industries and are also healing agents in inflammation, burn, piles, and gonorrhea-related ailments (Boroushaki *et al*., 2016). Tannins in plants inhibit insect growth and disrupt digestive events in ruminal animals, to bind cell walls of ruminal bacteria, preventing growth and protease activity (Tamokou *et al.,* (2017). Shi *et al.*, (2004) reported that the clinical studies on saponins have suggested they are health-promoting components that affect the immune system in ways that help to protect the human body against cancers, and lower cholesterol levels. The authors further stated that saponins has the potentials to decrease blood lipids, lower cancer risks and blood glucose response, respectively.Phenolic compounds and flavonoids are generally known as antioxidants and other important bioactive agents. Their benefits for human health, curing and preventing many diseases (Tungmunnithum*et al.,* 2018).

As reported in the study, Agidew (2022) confirms that Saponins were present in medicinal plants such as citrus fruit juice, *Mangifera indica* leaves, *Persea americana*, *Vernonia amygdalina* leaf and Stem bark. Also, the author reported phenolics citrus fruit juice, peel and juice of citrus medica, *Mangifera indica* leaves and *Persea Americana* and eucalyptus leaves. Bansal and Priyadarsini (2021) described phytochemicals as products of by plants used as defense mechanism against pathogens. They are also reportedly used as treatment for many metabolic, immunological and neurological disorders in humans in different parts of the world as a component of traditional medicine (Fokunang, 2011. It therefore implies that respondents in Jema'a LGA benefit from the medicinal values of plants in their home gardens rich in phytochemical properties. Fokunang (2011) noted that several medicinal plants with anti-inflammatory, anticancer, anti-diabetic antioxidant and antimicrobial activities, among others of pharmaceutical status in developing new chemical entities (NCE), have been phyto-chemically screened and characterized by natural product chemists. They noted that activities have tested by biochemist, toxicologist and pharmacologists, in animal models (in vivo), cell lines, pathogen (bacteria, fungi, viruses), parasites (Malaria Plasmodium, sleeping sickness (Trypanosome) and many others.

Most respondents in this study acquired their knowledge of medical plants from their tradition/cultural sources. It may be implied that this awareness exacerbated the establishment and wide spread of home garden in the Jema'a LGA. Also, many respondents in believed plants cure diseases. This could be attributed to the knowledge of different diseases perceived to treated by medicinal plants in the study are. In Africa settings, cultural values and knowledge are often handed down to younger generations by the older ones. That information sharing was reported by the respondents in this study. This finding agrees with the report of Dlamini and Nokwanda (2021) that preserving traditional medicinal knowledge is achieved by indigenous knowledge communicated verbally from generation to generation.

CONCLUSION

This study sought to identify and document the diversity, usage frequency, and cultural significance of medicinal plants cultivated in home gardens across Jema'a Local Government Area, Kaduna State, as well as to evaluate the phytochemical composition of the most utilized species.The study highlights the rich ethnobotanical knowledge and biodiversity present in home gardens of Jema'a Local Government Area, with 44 distinct plant species identified for their medicinal uses. CII values species like *M. oleifera*, *M. indica*, and *A. indica* underscore their significance in local healthcare practices. The diversity across 34 plant families, led by Fabaceae and Rutaceae, reflects the

ecological richness of the region and emphasizes the need for conservation efforts. Phytochemical screening confirmed the presence of key bioactive compounds such as flavonoids, alkaloids, and terpenoids in the most utilized species. Community knowledge, predominantly passed through traditional and familial channels, reinforces the cultural depth of herbal medicine in the area. Ailments such as stomach pain, malaria, and diarrhea had the highest consensus among respondents regarding plant-based treatments, affirming the practical importance of these species. To sustain this heritage and biodiversity, respondents recommended strategies including the encouragement of medicinal plant cultivation, public awareness, conservation efforts, and the prevention of environmental degradation. These findings underscore the critical role of home gardens in healthcare, cultural preservation, and biodiversity management in Jema'a.

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