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SETTING CONSERVATION PRIORITIES FOR MIMOSOIDES OF MEDICINAL IMPORTANCE IN NORTHERN PART OF KATSINA STATE, NIGERIA

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ABSTRACT

Katsina State is experiencing rapid desertification, primarily caused by factors like habitat destruction from human-made disasters such as military operations against insurgents, conversion of land for housing due to population growth, and extensive logging for fuel and construction purposes. These factors are significantly endangering the diversity of medicinal plants in the region. In this study, an attempt was made to document the ethnobotanical knowledge, cultural importance and vulnerability index of some highly utilized Mimosaceae species of Katsina with a view of proposing conservation priorities. Semi-structured questionnaire method was employed to obtain information on the cultural utilization of the species from purposively identified respondents. Results revealed that 12 Mimosoid species are utilized for seven (7) cultural purposes (medicine, fuel, technology, fencing, ornamental, ink production and tanning). Cultural Importance Index revealed that the species are mostly used for medicinal purpose and Relative Frequency of Citation (RFC) revealed that *Vachellia nilotica* is the most widely used species for that purpose. Leaves appeared to be the most frequently used plant's organ and medications were mostly prepared as decoction while oral was the most common route of administration. *Vachellia sieberiana* had the highest Vulnerability Index followed by *Vachellia nilotica*, *Vachellia seyel* and *Senegalia hockii*. Conservation efforts toward protecting these species from becoming lost are strongly recommended.

Keywords: Mimosoid, Route of administration, Medicinal plant, Ethnobotanical.

INTRODUCTION

The use of plants for medicinal purposes dates back to the beginning of human civilization (Mosihuzzaman, 2012). A significant number of indigenous plants have been recognized for their medicinal properties, which our ancestors utilized through methods such as decoctions, infusions, and other herbal practices and beliefs. Across various cultural systems, plants have been combined with rural and mystical traditions (Awudu, 2000). The medicinal benefits of these plants are attributed to their phytochemical components, which elicit various physiological and pharmacological responses in the human body (Edeoga *et al*., 2005; Ekanom and Udo, 2011). It is known that there are approximately 200,000 natural products derived from plants, with on-going discoveries from both higher plants and microorganisms (Kinghorn *et al*., 2011; Strobe *et al*., 2004). Medicinal plants play a crucial role in human healthcare. The use of traditional medicines and medicinal plants as therapeutic remedies is widespread in most developing countries, serving as primary healthcare options. According to the World Health Organization (WHO), approximately 80% of the population in these countries relies on traditional medicines, primarily derived from plants (Schmincke, 2003). Medicinal plants are an integral component of the natural biodiversity in many African countries (Okigbo *et al*., 2008).

Indigenous plants thrive in wild, semi-wild, and cultivated environments and many are also used as food, fuel, fodder, and for construction purposes (Edeoga *et al*., 2005). However, due to increasing scientific and commercial interest in medicinal plants, there has been a growing demand for wild plant populations. This heightened demand has led to the over-harvesting of many medicinal plant species, putting them at risk of extinction. Furthermore, the commercial exploitation of these plants has sometimes resulted in shortages of traditional medicines for indigenous communities who depend on them for primary healthcare (Bello *et al*., 2019). Globally, it is estimated that around 15,000 species of medicinal plants are facing extinction. Specialists warn that the Earth is losing potentially significant medicinal resources at a rate of at least one species every two

years (CBD, 2008).

The Subfamily Mimosoideae (regarded as Mimosaceae Family by some authorities), is made up of 82 genera and over 3,200 species of tropical or subtropical trees or shrubs. They have alternate leaves bipinnate or modified to phyllodes which look like simple leaves.Inflorescence usually spikes, racemes or heads of small, actinomorphic, tri to hexamerous flowers. Sepals usually aggregate into a calyx. Petals occur in bunch, free or united below to form a tube. Stamens 4-10, usually same or double the number of petals or numerous. Pods and seeds vary in shape and size but seeds generally have an areole (Wanda *et al.*, 2015). Like other members of the Family Fabaceae, Mimosoides are found in diverse ecosystems with members present and often dominant in nearly all vegetation in the tropics. They are well known for their therapeutic importance as their anticancer, antidiabetic, antioxidant, hepatoprotective, anti-inflammatory, hypolipidemic, antinoniceptive, neuropharmacological, antiepileptic, antiallergic, toxicological, antihyperurisemic, antiparasitic, larvicidal, mollucidal, genotoxic, antimutagenic, teratogenic, antispasmolytic, antiviral, and antivenom properties were previously reported (Majeed *et al.*, 2021). In Katsina State in particular, members of this subfamily are reported to have many medicinal properties including but not limited to anticancer, wound healing, hepatoprotective, anti HIV as well as widely used for managing maternal health conditions (Bello, *et al.*, 2019, Kankara *et al.*,2015, 2017, 2018, 2022). Beside utilization for medicinal purposes, Mimosoides are also widely used for fuel, construction, animal fodder, domestic utensils as well as art and craft (Tchapda *et al.*, 2022). The rising demand for medicinal plants, coupled with the expanding human population, generates persistent pressure on existing resources. This results in the ongoing depletion and extinction of certain species in the wild. Simultaneously, there is an alarming rate of loss of natural wild flora. Mimosoides species are not spared from this trend; in fact they are among the unsustainably overexploited plants' species in the study area.

Like in many other states in Nigeria, loss of medicinal plants' diversity is escalating at an alarming rate in Katsina (Bello *et al.*, 2019). This may not be unconnected to the fact that the state experiences adverse effects of desertification and excessive indiscriminate felling of trees for firewood and timber as well as unsustainable exploitation of plants for medicinal purposes by majority of the population who could not afford orthodox medicine due to their poor economic status, especially in the northern part of the state. Hence there is need to document the utilisation of the economically important species with the aim of unravelling conservation priorities.

MATERIALS AND METHODS

Study area

This study was conducted in Katsina State, situated in the northern region of Nigeria. Katsina State spans an area of 23,938 square kilometers and is positioned between latitudes 11°08'N and 13°22′N, and longitudes 6°52′E and 9°20′E, with an elevation of 465 meters above sea level. It is bordered by Niger Republic to the north, Jigawa and Kano States to the east, Kaduna State to the south, and Zamfara State to the west. The state comprises 34 local government areas grouped into three Senatorial Zones: Katsina South, Katsina North, and Katsina Central. (Kankara *et al.*, 2015). For the purposes of this research, northern Katsina (which includes the Katsina North Senatorial District and selected Local Government Areas from the Katsina Central Senatorial District) was deliberately chosen due to its proximity to Sahara-like conditions and relative security considerations.

Data collection

Ethno-botanical data was obtained using questionnaire and interview. The questions were based on the objectives of the research and were written in English language. However, for those who cannot read or understand the language, research assistants were employed to ensure proper completion of the questionnaires. The target groups for the study were herbalist, traditional birth attendants, traditional physicians, farmers, old ages and other people who have practiced and used medical plant.

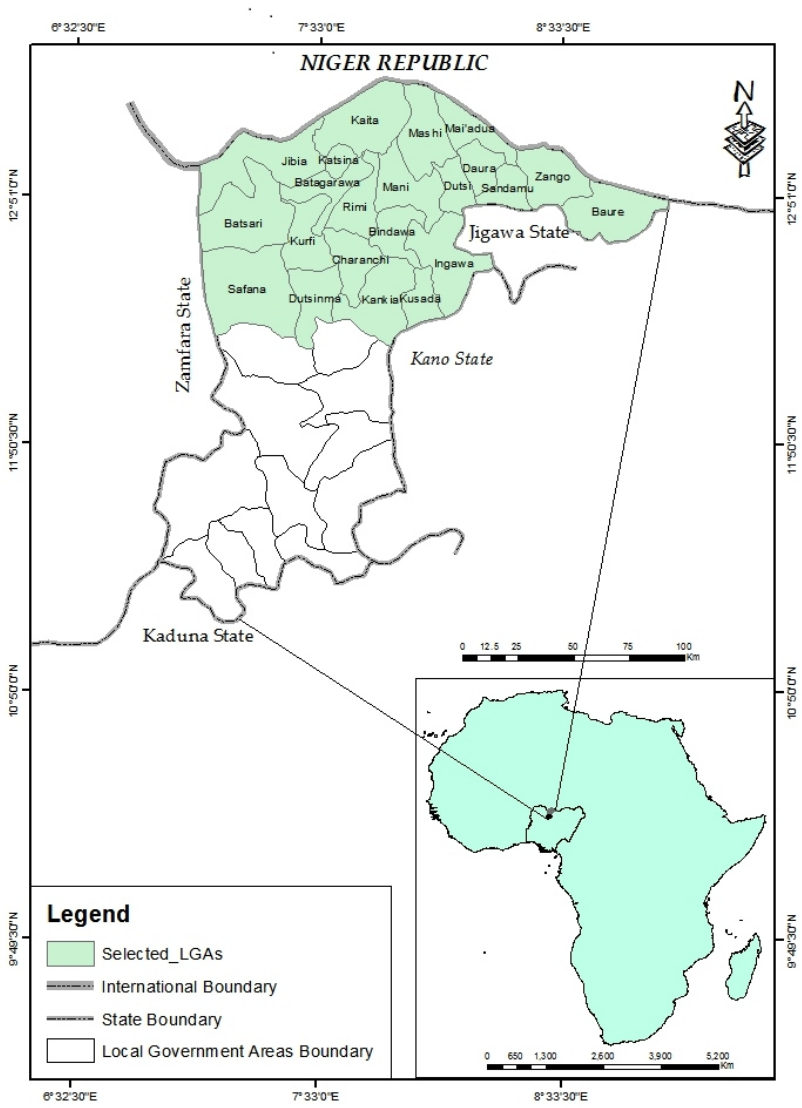

Figure 1: Map of Katsina State, Showing the Study Area (Source: Cartography Lab, UMYU)

Collection and identification of plant specimens

Several field expeditions were carried out to gather plant specimens from both natural habitats and home gardens, facilitated by guides selected from the participants. Identification of these collected plants was accomplished using herbarium specimens and literatures specific to Nigerian medicinal plants. Online plant diversity resources were also consulted to verify plant identities. Voucher specimens were collected, pressed, and deposited in the herbarium at Umaru Musa Yar'adua University in Katsina, Nigeria.

Data analysis

The data generated from the study was compiled into Microsoft Excel spreadsheets and subsequently imported into Statistical Package for Social Sciences (SPSS) for analysis. Descriptive statistics using percentage were employed to analyse the demographic data while some ethnobotanical indicies were used to analyse the ethnobotanical data. The Relative Frequency of Citation (RFC) was computed using the formula RFC = Fc / N, where Fc represents the number of respondents citing a particular species, and N is the total number of respondents. Quantitative analysis was utilized to calculate use and cultural value indices following the definitions by Tardío and Pardo-de Santayana (2008) and Albuquerque , (2006) for studies involving multiple species

Frequency of Citation (FC), which is the number

of informants who cited the use of a particular organ of the species:
Number of Uses (NU), which is the number of usage categories for each organ of the species:

$$FCs = \sum_{i=i1}^{iN} URi \quad (1)$$

$$NUs = \sum_{u=u1}^{Unc} URu \quad (2)$$

Use Report (UR), this is the number of uses reported by all informants for each organ
Then, indices from the basic metrics were also calculated:
Relative Frequency of Citation (RFC):

$$URs = \sum_{u=u1}^{Unc} \sum_{i=i1}^{iN} URui \quad (3)$$

$$RFCs = \frac{FCs}{N} \quad (4)$$

Cultural Importance Index (IC) was calculated by dividing UR by the number of informants

Use value (UV) per species organ:
Finally, the Vulnerability Index (IV) of the species was calculated based on the following formula:

$$UV_s = \sum UR_f N \quad (5)$$

IV=N/4, with N=N1+N2+N3+N4.

Where N1 represents the frequency of species citation, N2 denotes the number of use categories in which the species was utilized, N3 signifies the organ used, and N4 indicates the harvesting method (Badjaré *et al.*, 2018). These parameters serve as primary indicators of the pressures and threats facing the species within the study area.

Species vulnerability is assessed based on the Importance Value (IV): species with an IV < 2 are considered to have low vulnerability, those with 2 IV < 2.5 are moderately vulnerable, and species with an IV 2.5 are classified as highly vulnerable.

RESULT

Socio Demographic Information

Table 1 presents the socio-demographic characteristics of the survey respondents. It shows that out of the total 150 respondents interviewed, there were 75 males (50%) and 75 females (50%). A significant portion of the respondents (24%) identified themselves as herbalists. The survey also highlighted that a majority of the respondents belong to the older age group, specifically between the ages of 45-60.

Medicinal Uses of Identified Mimosoidsin theNorthern Part of Katsina State

In the present study, a total of twelve (12) Mimosoids were reported (Table 2). The identified species were *Faidherbia albida, Senegalia ataxacanta, S. gourmaensis, S. macrostachya, S. polyacantha, S. Senegal, Vachellia niotica, V. pycnantha, V. seyal, V. sieberiana* and *V. tortilis*. The species were reported to be used in treating various ailments. The result shows that *V. siberiana* has the highest number of medicinal uses as it is being used to treat eighteen (18) different diseases. It was followed by *V. hockii* which has sixteen (16) medicinal uses. *S. senegal, V. nilotica, S. ataxacantha,* and *S. gourmaensis* were next to this in that each of them was used in treating fourteen (14) different ailments. *V. tortilis* was reported to be used for thirteen (13) ailments. *V. seyal* had (ten) 10 medicinal uses while *S. macrostchya* and *V. pycnantha* had eight (8) medicinal uses each.

Table 1: Socio-demographic characteristics of the survey informants for the ethnobotanical knowledge on some Mimosoidesin the northern part of Katsina State.

Socio-demographic variables	No. of respondents	Percentage of respondents
Gender		
Male	75.00	50.00
Female	75.00	50.00
Age group		
15-30	18.00	12.00
30-45	18.00	12.00
45-60	48.00	32.00
60-75	47.00	31.33
75-above	19.00	12.67
Marital status		
Married	106.00	70.67
Single	17.00	11.33
Divorce	13.00	8.67
Widow	14.00	9.33
Occupation		
Farmers	31.00	20.67
TBAs	30.00	20.00
TP	19.00	12.67
Old Ages	20.00	13.33
Herbalist	36.00	24.00
Others	14.00	9.33
Educational qualification		
Non-formal	66.00	44.00
Primary	14.00	9.33
Secondary	15.00	10.00
Tertiary	19.00	12.67
Apprenticeship	36.00	24.00

TBAs: Traditional Birth Attendants TP: Traditonal Physicians

Table 2: Mimosoids of medicinal importance in Northern part of Katsina State.

SCIENTIFIC NAME	VERNACULAR NAME	VOUCHER NUMBER	MEDICINAL USES
Faidherbia albida (Delile) A. Chev.	Gawo	UMYUH-2373	Nose bleeding, Dysentery, Stomach ache, Tooth ache, Diarrhea, Pile, Measles, Headache, Rashes, Cough, Wound healing, Dandruff, Toilet infection.
Senegalia ataxacanta (DC.) Kyal&Boatwr	Sarkakiya	UMYUH-2374	Stomach ache, Aphrodisiac, Body well-being, Rashes, Typhoid fever, Wound healing, Immunity, Constipation, Asthma, Hypertension, Baby teething, Dysentery, Whitlow, Back ache
Senegalia gourmaensis(DC.) Kyal&Boatwr	Kama mu raba	UMYUH-2375	Body well -being, Rashes, Yellow fever, Diarrhea, Paralysis, Ear ache, Malaria, Hypertension, Dysentery, Immunity, Pile, Cough, Aphrodisiac, Wound healing.
Senegalia macrostachya(DC.) Kyal&Boatwr	Gardaye	UMYUH-2376	Prevent blood lost, Aphrodisia c, Rashes, Wound healing, Immunity, Breast milk enhancement, Malaria, Typhoid.
Senegalia polyacantha (Willd.) Seilger&Ebinger	Farcenshaho	UMYUH-2377	Typhoid fever, Yellow fever, Malaria, Breast milk enhancement, Immunity, Breast cancer, Hypertension, Too th ache, Dysentery, headache, Stomach ache.
Senegalia senegal (L.) Britton	Dakwara	UMYUH-2378	Rashes, Ulcer, Stomach ache, Hemoroidanticmetic, Skin disorder, Dandruff, Diarrhea, Dysentery, Typhoid, Cholera, G. worms, Bilharzia, Headache.
Vachellia nilotica(L.) P.J.H. Hurther&Mabb	Bagaruwa	UMYUH-2380	Rashes, wound Healing, Ulcer, Dysentery, Skin diseases, Maternal problems, Toilet infection, Cosmetology, Bladder, Problems, Diarrhea, Breast milk enhancement, G. worms

SCIENTIFIC NAME	VERNACULAR NAME	VOUCHER NUMBER	MEDICINAL USES
Vachellia pycnantha Benth.	Hujumi	UMYUH-2384	Cosmetology, Ulcer, Breast milk enhancement, Aphrodisiac, Rashes, Typhoid, Pile, Yellow fever
Vachellia seyal (Delile) P.J.H. Hurter	Dushe/bauji	UMYUH-2382	Malaria, Typhoid, Menstrual pain, Prevent blood loss, Skin diseases, Ear ache, Immunity, Hypertension, Yellow fever, Stomach ache.
Vachellia sieberiana (DC.) Kyal&Boatwr	Farar kaya	UMYUH-2383	Bilharzia, Aphrodisiac, Toilet infection, Chest pain, Measles, Pile, Immunity, Stomach aches, Body swelling, Temperature control, Diabetes, Malaria, Typhoid, Skin diseases, Maternal problems, Yellow fever, Back ache
Vachellia tortilis (Forssk.) Galasso&Banfi	Namijinbagaruwa/ kandili	UMYUH-2381	Dysentery, Stomach aches, Aphrodisiac, Ulcer, Sore throat, Maternal problem, Skin disorders, Immunity, Choroids, R ashes, Wound healing, Asthma, Body well being

Parts Used, route of Administration and Methods of Preparation

The frequency of plant parts used is depicted in Figure 2. The results show that leaves were the most commonly utilized plant part in this study, followed by stem bark and seeds. The results also revealed that thorn and gum exudates were the least used plant parts. The result of the route of administration of herbal preparations is presented in Figure 3. According to the result, most of the preparations are taken orally. Decoction is the most frequently used method of preparation, followed by maceration. For *Vachellia nilotica*, the most common method is sitting baths at 0.27%, followed closely by plastering at 0.26%. Decoction accounts for 0.24%, gruels for 0.13%, and both bathing and maceration for 0.05% each. Mouthwash is the least common mode of preparation at 0.02%. For *Senegalia gourmaensis* and *Senegalia polyacantha*, maceration is the most common method of preparation, followed by decoction. Steaming is the least common route of administration for *Vachellia sieberiana* at 0.01%. For *Senegalia gourmaensis*, ointment is used at a frequency of 0.02%, while cream and fumigation each account for 0.05%..... Rubbing is used at a frequency of 0.05% for *Senegalia macrostachya*. (Table 3).

Use Report and Cultural Importance

Fuel wood and fodder had the highest number of use report and cultural importance. This isclosely followed by medicinal uses except for some species like *S. gourmaensis, S. hockii, V. nilotica* and *V. seyal* where medicinal uses had the highest number of use report. Fencing is next to fuel wood and medicinal, then, craft and technology. For ornamental uses, only *V. pycnantha* is utilized with a use value of 28.00 citations. Similarly for ink production, *V. sieberiana* and *V. seyal* are the only two species used and their use values are 59.00 and 3.00 number of citation, respectively (Table 4).

Basic Indices and Vulnerability Index

The results show that *S. ataxacantha* and *S. gourmaensis* have the highest number of organs used followed by *F. albida, S. macrostchya, V. seyal, S. hockii* and *V. siberiana*in whichfour (4)organs were used. Three (3) organs were used in*S. senegal, V.*

nilotica, V. tortilis and *V. pycnantha*(Table 5). *V. siberiana* has the highest value of Vulnerability Index followed by *V. nilotica, V. seyal* and *S. hockii,* while *V. pycnantha* shows the lowestVulnerability Index .

Conservation Status

The results show that eight out of the 12 Mimosoids identified in this study belong to "Least Concern" status according to the IUCN list, while *S. senegal, S. gourmaensis, S. polyacantha* and *S. hockii* have no record on the IUCN red list (Table 6).

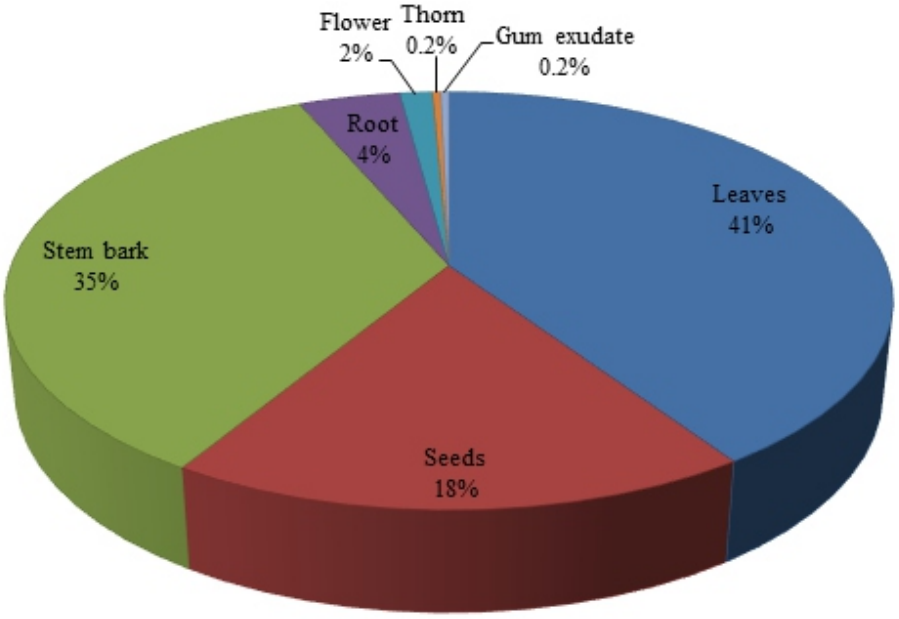

Figure 2: Parts of Mimosoids used for medicinal purpose in Katsina State.

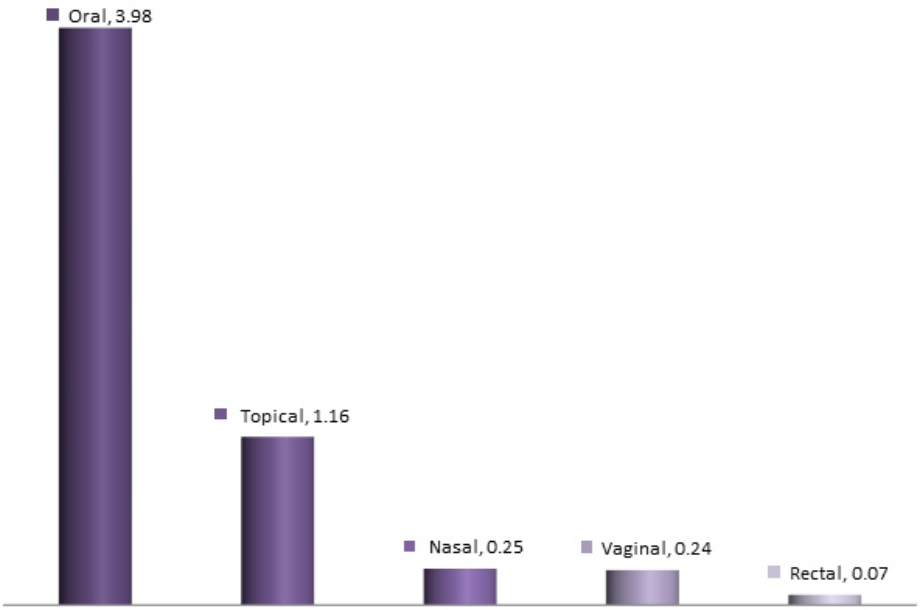

Figure 3: Frequency of citation for routeof administration of Mimosoidsin the northern part of Katsina State.

Table 3: Relative frequency of citations of the different modes of preparation (%) of herbal remedies from some Mimosoides in the Northern part of Katsina State.

Species	Maceration	Decoction	Plaster	Gruels	Mouth Wash	Sit Bath	Bath	Rubbing	Fumigation	Ointment	Cream	Steaming
F. albida	0.13	0.16	0.05	0.12	0.03	0.07	0.00	0.00	0.02	0.00	0.00	0.00
S. ataxacantha	0.13	0.19	0.07	0.09	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00
S. gourmaensis	0.11	0.08	0.03	0.04	0.00	0.03	0.05	0.00	0.00	0.02	0.00	0.00
S. hockii	0.10	0.13	0.03	0.03	0.00	0.01	0.02	0.00	0.00	0.00	0.01	0.00
S. macrostachya	0.00	0.11	0.02	0.08	0.00	0.01	0.00	0.05	0.00	0.00	0.00	0.00
S. polyacantha	0.23	0.17	0.02	0.01	0.03	0.00	0.02	0.00	0.00	0.00	0.00	0.00
S. senegal	0.15	0.46	0.10	0.11	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
V. nilotica	0.05	0.14	0.26	0.13	0.02	0.27	0.05	0.00	0.00	0.00	0.00	0.00
V. pycnantha	0.02	0.04	0.01	0.05	0.00	0.00	0.04	0.00	0.01	0.00	0.03	0.00
V. seyal	0.05	0.15	0.00	0.04	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00
V. sieberiana	0.09	0.21	0.04	0.07	0.00	0.11	0.00	0.00	0.00	0.00	0.01	0.01
V. tortilis	0.02	0.27	0.03	0.05	0.00	0.02	0.03	0.00	0.00	0.00	0.00	0.00
Total	1.08	2.11	0.66	0.82	0.08	0.52	0.31	0.05	0.05	0.02	0.05	0.01

Table 4: Use report and use values of the different usage categories of some medicinal Mimosoids in

	Use reports (UR)							Cultural Importance (C.I)							
Species	MED	FUEL	TECH	FENC	ORNA	INK	OTH	MED	F&F	C&T	FENC	ORNA	INK	OTH	TCI
F. albida	87.00	102.00	7.00	48.00	0.00	0.00	0.00	0.58	0.68	0.05	0.32	0.00	0.00	0.00	1.63
S. ataxacantha	75.00	78.00	2.00	74.00	0.00	0.00	0.00	0.50	0.52	0.01	0.49	0.00	0.00	0.00	1.53
S. gourmaensis	53.00	55.00	0.00	54.00	0.00	0.00	0.00	0.35	0.37	0.00	0.36	0.00	0.00	0.00	1.08
S. hockii	49.00	48.00	15.00	28.00	0.00	0.00	3.00	0.33	0.32	0.10	0.19	0.00	0.00	0.02	0.95
S. macrostachya	40.00	42.00	0.00	42.00	0.00	0.00	0.00	0.27	0.28	0.00	0.28	0.00	0.00	0.00	0.83
S. polyacantha	71.00	72.00	0.00	71.00	0.00	0.00	0.00	0.47	0.48	0.00	0.47	0.00	0.00	0.00	1.43
S. senegal	125.00	125.00	0.00	122.00	0.00	0.00	0.00	0.83	0.83	0.00	0.81	0.00	0.00	0.00	2.48
V. nilotica	139.00	137.00	26.00	35.00	0.00	0.00	74.00	0.93	0.91	0.17	0.23	0.00	0.00	0.49	2.74
V. pycnantha	30.00	30.00	2.00	0.00	28.00	0.00	0.00	0.20	0.20	0.01	0.00	0.19	0.00	0.00	0.60
V. seyal	49.00	44.00	23.00	14.00	0.00	3.00	4.00	0.33	0.29	0.15	0.09	0.00	0.02	0.03	0.91
V. sieberiana	79.00	86.00	19.00	8.00	0.00	59.00	0.00	0.53	0.57	0.13	0.05	0.00	0.39	0.00	1.67
V. tortilis	63.00	65.00	11.00	9.00	0.00	0.00	44.00	0.42	0.43	0.07	0.06	0.00	0.00	0.29	1.28

Key:
MED = Medicinal; = Food and Fuelwood; TECH = Technology; FENC = Fencing; ORNA = Ornamental; INK = Ink production;
OTH = Other uses. TCI= Total Cultural Importance

Table 5: Basic indices and vulnerability index of the different plant's parts used as herbal remedies

	Basic indices					VI parameters				
Species	FC	RFC	NU	RNU	OU	NOU	RI	P1	P2	P3	VI
F. albida	244.00	0.59	4.00	0.57	L.S.B&R	4	0.58	2.00	2.00	3.00	2.33
S. ataxacantha	229.00	0.56	4.00	0.57	L,S,B,R&F	5	0.56	2.00	2.00	3.00	2.33
S. goumensis	162.00	0.39	3.00	0.43	L,S,B,R&F	5	0.41	2.00	2.00	3.00	2.33
S. hockii	143.00	0.35	5.00	0.71	L,S,B&R	4	0.53	2.00	3.00	3.00	2.67
S. macrostachya	124.00	0.30	3.00	0.43	L,S,B&R	4	0.37	2.00	2.00	3.00	2.33
S. polyacantha	214.00	0.52	3.00	0.43	L,S,B&R	4	0.47	2.00	2.00	3.00	2.33
S. Senegal	372.00	0.91	3.00	0.43	L,S&B	3	0.67	3.00	2.00	2.00	2.33
V. nilotica	411.00	1.00	5.00	0.71	L,S&B	3	0.86	3.00	3.00	2.00	2.67
V. pycnantha	90.00	0.22	4.00	0.57	L,B&F	3	0.40	2.00	2.00	2.00	2.00
V. seyal	137.00	0.33	6.00	0.86	L,S,B*R	4	0.60	2.00	3.00	3.00	2.67
V. sieberiana	251.00	0.61	5.00	0.71	L,B,R&F	4	0.66	3.00	3.00	3.00	3.00
V. tortilis	192.00	0.47	5.00	0.71	L,B&R	3	0.59	2.00	3.00	2.00	2.33

Keys:
FC= frequency of citations; **RFC =** relative frequency of citations; **NU =** number of uses; **RNU =** relative number of uses; **OU =** organs used; **NOU =** number of organs used; **RI =** relative index; **VI** = vulnerability index; **L** = Leaves; **S** = Stem; **B**= Bark; **R** = Root; **F** = Flowers.
Scoring:
P1: scored 1 if FC = 20%;scored 2 if FC = 20% to 60%; scored 3 if FC > 60%
P2: scored 1 if NU < 2; scored 2 if 2 NU 4, scored 3 if NU 5
P3: scored 1 if NOU < 2; scored 2 if 2 NOU 3; scored 3 if NOU 4

Table 6: Conservation status of identified Mimosoids in the study area (IUCN)

S/N	SPECIES	STATUS
1	*F. albida*	LC
2	*S. ataxacantha*	LC
3	*S. hockii*	NR
4	*S. gourmaensis*	NR
5	*S. macrostachya*	LC
6	*S. polyacantha*	NR
7	*S. senegal*	NR
8	*V. nilotica*	LC
9	*V. pycnantha*	LC
10	*V. seyal*	LC
11	*V. sieberiana*	LC
12	*V. tortilis*	LC

LC: Least Concern **NR: Not Registered**

DISCUSSION

Socio-demographic information of the respondents

Demographic information of the respondents reveals that majority were male and herbalist of relatively old age. This suggests a notable generational gap in ethnomedicinal knowledge between older and younger generations. Similar observations were noted in Livingstone, Southern Province of Zambia (Chinsembu, 2016). This also align with findings by Kisangau*et al.* (2007), who found that 73% of respondents in a study on ethnomedicine related to HIV/AIDS opportunistic infections in rural Tanzania were over 50 years in age. This demographic trend raises concerns about the potential loss of indigenous knowledge with the passing away of older generations (Kankara *et al*., 2015). Cultural changes associated with modernization have contributed to a decline in the appreciation of traditional values among younger generations (Giday *et al*., 2003). Furthermore, a majority of the respondents had no formal education, a factor previously linked to the erosion of traditional knowledge. Bruyere *et al.* (2016) noted a negative correlation between formal education and knowledge of medicinal plants, attributing this to the time constraints imposed by formal education and a tendency to disregard traditional knowledge.

Medicinal Mimosoids of the Northern Part of Katsina State

It can be inferred from the results obtained that all the identified Mimosoids in the study area are used in traditional medicine. Previous studies also reported the use of the identified Mimosoides in traditional medicine (Zahoor *et al.,* 2017; Kefalew *et al*., 2015; Tahani *et al.,* 2018; Teklehaymanot, 2017). *V. sieberiana* was reported to be used in treating oedema and this is in consonant with the findings of Tchatchedre *et al.* (2019). The use of *V. hockii* in the treatment of malaria was also reported by Tchatchedre*et al*., (2019*). V. nilotica* and *V. senegal* were also reported to be used in wound healing by Tchatchedre*et al.* (2019).

Parts Used, Route of Administration and Methods of Preparation

Leaves were the most utilized plant parts in this study. The preference for using leaves in herbal medicine can be attributed to their availability and ease of collection compared to other plant parts. Additionally, leaves contain higher concentrations of phytochemicals, as they are the primary organs for photosynthesis (Asigbaase *et al*., 2023). Previous studies have also noted the frequent use of leaves in various herbal preparations (Zahoor-Zahoor*et al*., 2017; Odewo and Adeyemo, 2018). In contrast, some other studies like that of (Chalabra *et al*., 1993) reported roots as the most frequently used plant part in herbal preparations. Unfortunately, harvesting roots often involves uprooting the entire plant, which can lead to its demise. This practice poses risks to plant survival and biodiversity. Indeed, using leaves in traditional remedies offers an advantage in terms of biodiversity conservation compared to the potentially detrimental effects of harvesting roots and barks (Giday *et al*., 2003; Zheng and Xing, 2009).

In this study, most herbal preparations are taken orally. This agrees with the previous findings, that oral ingestion is the most frequently used route of administration in traditional medicine (Otang*et al.,* 2012; Musa *et al.,* 2011, Kankara*et al.,* 2022). Majority of the surveyed species are prepared as decoctions. Previous ethnobotanical studies have shown that decoction is the most preferred method for preparing herbal remedies (Daswani*et al*., 2011; Kankara*et al*., 2015, 2022). Decoction is favored due to its simplicity and efficiency (Rasul, 2018). From this study, it was gathered that herbal preparations were typically administered in forms such as decoctions, macerations, gruels, plastering, mouth washes, baths, sit baths, rubbings, steaming, fumigations, ointments, and creams. Potassium is commonly added to decoctions to mitigate their bitter taste. Additionally, various additives including cow milk, porridge, honey, and others were usually mixed with powdered medicines during preparation. These findings align with findings from previous studies by diverse authors (Bulut *et al*., 2017; Palheta *et al*., 2017; Demie *et al*., 2018).

Use Report and Cultural Importance

Fuel wood, fodder and medicine were the most frequent cultural importance reported in this study. It is commonly believed that the cultural

significance of a plant depends on both the frequency of citation (FC) by informants and the number of different uses (NU) it has (Mateo-Martín *et al*.,, 2023) Various indices, such as the UV index (Phillips and Gentry, 1993), the RI index (Pardo-de-Santayana, 2003), and the CV index (Reyes-García *et al*., 2006), have been developed to incorporate these variables. However, NU can be significantly influenced by the number of use-categories considered in the study. It is also recognized that plants with multiple uses are generally more familiar to people than those with only one use, suggesting that versatility enhances a plant's perceived usefulness across different cultures (Subasi *et al*., 2020).

Basic Indices and Vulnerability Index

The susceptibility of a plant species is influenced by factors such as the category of use, the organs harvested, the frequency of utilization, the method of collection, and the developmental stage at which the plant is harvested (Ayéna *et al*., 2016; Agbo *et al*., 2017; Traoré *et al*., 2021). Additionally, the morphological characteristics of the species also play a role in determining its vulnerability (Dassou *et al*., 2014). This vulnerability escalates particularly when the removed plant organ does not regenerate easily. Although *V. siberiana* is not the most cited species in this study, number of its organs used for different purposes exposes it to this high vulnerability. It was earlier reported that *V. siberiana* was one of the rare species among plants used for the management of hypertension and diabetes in Sub-Sahelian area of Burkina Faso, West Africa (Compaoré *et al*., 2022).

Conservation Status

Most of the cited species in this study belong to the "Least Concern" of Internatiol Union for Conservation of Nature (IUCN) category while few have no record at all. While the IUCN Red List of Threatened Species is a crucial global tool for conservation, it focuses on assessing the extinction risk of only a limited and biased subset of known biodiversity (Batchman *et al*., 2019). The conservation status of a species indicates its likelihood of survival in the present or future. Within the framework of the IUCN Red List, a species is classified as vulnerable when it faces a high risk of near-term extinction in the wild (IUCN 2012). A species is considered threatened when it is believed to be at risk of becoming extinct. It's important to note that when a forest tree is endangered, it indicates a decline in both its quantity and genetic diversity. Urgent conservation action is necessary to prevent extinction, particularly in the face of global warming impacts on Earth's surface (Maslova and Elizaryeba, 2023). Therefore, there is a critical need for conservation strategies to preserve these indigenous trees for future use and mitigate the effects of global warming.

CONCLUSION

From the obtained results, it can be concluded that 12 Mimosoides (*F. albida, S. ataxacanta, S. gourmaensis, S. hockii, S. macrostachya, V. nilotica, S. polyacantha, V. pycnantha, V. senegal, V. seyel, V. sieberiana and V. tortilis*) are utilized for seven (7) cultural purposes (medicine, fuel and fodder, craft and technology, fencing, ornamental, ink production and tanning) in the northern part of Katsina's state, even though the species were mostly utilized for medicinal purpose. It is worth noting that the medicinal importance of *S. gourmaensis, S. hockii, S. macrostachya, V. pycnantha*and *V. tortilis*is reported from the study area for the first time. The relative frequency of citation revealed that *V. nilotica* is the most utilized species from the study area. Leaves were the most common plant part used and the medications were mostly prepared as decoction and taken orally. *V. nilotica, V. senegal* and *V. siberiana* have the highest number of cultural values but *V. siberiana* has the highest Vulnerability Index of 3.00 followed by *V. nilotica, S. hockii* and *V. seyal* with 2.67 each. It is therefore recommended that urgent conservation priorities should be given to these species.

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CONFLICT OF INTEREST

The authors hereby certify that they have no affiliation with or involvement in any organization or entity with any financial or non-financial interest that will influence the results discussed in this manuscript.

AUTHORS' CONTRIBUTION

K.S.S.: Conceptualization, Supervision, Investigation, Resources, Writing (Original Draft, Review & Editing), Validation, Visualization.

I.S.: Resources, Data curation, Project administration, Visualization.

B.K.A.: Investigation, Methodology, Formal Analysis, Visualization.

D.A.M.: Methodology, Project administration, Visualization.

I.H.Z.: Methodology, Validation, Writing (Review & Editing)

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