Ethnomedicinal Survey of Plants used for Management of Inflammatory Diseases in Ringim Local Government, Jigawa State, Nigeria

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Research

Abstract

Background: Physical trauma, unpleasant chemicals, or microbial infections produce inflammation, which is a typical defensive reaction to wounded tissue. It is the body's response to inactivate or eliminate invading pathogens, remove irritants, and prepare tissues for repair. Inflammation is called ***Kumburi*** *by* ***Hausa*** tribe of northern Nigeria. Minor or chronic inflammation is considered one of the major diseases affecting people all over the world. According to current estimates, almost 6 million people worldwide suffer from chronic inflammation. Nigeria has an abundance of biodiversity that has largely gone untapped, and it could be a source of new lead compounds for the treatment and control of inflammation. This research was aimed to documents and evaluate the traditional methods used for the management of inflammatory diseases in the Ringim Local Government Area of Jigawa State.

Methods: Ethnobotanical study for the medicinal plants that are used in the management of inflammatory diseases were conducted between the periods of May, 2016 – May, 2018 in Ringim Local Government Area of Jigawa State. Indigenous medicinal plant information was gathered utilizing a scientifically organized questionnaire with the aid of respondents who were considered in traditional/alternative medicine. Purposive sampling was used.

Results: .In total, 47 medicinal plant species were discovered in the study, which was divided into 25 families and used for the treatment and management of inflammation. To avoid any misidentification, species having the same local name were not collected. With ten species, Leguminosae is the most common family. Only species with a minimum of 0.6 relative frequency of citations were reported quantitatively. The study recorded the highest used value at (0.07), the relative frequency of citation (0.9), and the fidelity level 90 %.

Conclusion: Plants with medicinal potential are still the only way forward, as their acceptance and recognition spread over the globe. The current study found that residents of the Ringim local government had a good understanding of the therapeutic plant. Despite the advancement of modern medicine, locals continue to rely on traditional herbs for health treatment.

Keywords: Ethnomedicine, Ethnopharmacology, Inflammation, Management, Plants, survey

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Background

The release of chemical mediators from wounded tissues and migratory cells causes inflammation in most cases (Rankin, 2004). Chemical mediators such as histamine, serotonin, lipids such as prostaglandins, and tiny peptides such as kinins are all particular and rely on the type of inflammatory process (Abdulkhaleq *et al.* 2018). Physical trauma, unpleasant chemicals, or microbial infections produce inflammation, which is a typical defensive reaction to wounded tissue (Divya *et al.* 2016). It is the body's response to inactivate or eliminate invading pathogens, remove irritants, and prepare tissues for repair (Pungle *et al.* 2018). Inflammation is the body's natural defense system. The immune system recognizes and eliminates harmful and foreign stimuli, helping the body to heal (Pahwa *et al.* 2020). It is the world's leading cause of death (Fernandes *et al.* 2018; Sangiovanni *et al.* 2020; Pahwa *et al.* 2020). Several drugs are used to treat inflammatory illnesses, but long-term treatment can cause gastrointestinal discomfort, bone marrow depression, and water and salt retention (Jadav *et al.* 2010). Herbal remedies are becoming increasingly popular in recent years because herbal medications have no or minimal negative effects (Abdulrahman *et al.* 2018; Mahmoud *et al.* 2020). Plants continue to be a novel source of structurally essential molecules that contribute to the development of innovative medications, as traditional medicine expands to newer horizons. (Anilkumar, 2010). Minor or chronic inflammation is considered one of the major diseases affecting people all over the world. According to current estimates, almost 6 million people worldwide suffer from chronic inflammation (Namsa *et al.* 2009). Nigeria's flora is vast and rich, with many medicinal plants used by natives for therapeutic purposes (Sonibare Abegunde, 2012). Plants are known for containing a large number of chemical constituents. Nigeria has an abundance of biodiversity that has largely gone untapped, and it could be a source of new lead compounds for the treatment and control of inflammation (Durugbo *et al.* 2012). Simultaneously, the use of ethnobotanical surveys to gather and document indigenous medicinal plant knowledge is envisioned as a key tool for discovering potential active principles from the plant material in the local community (Mahmoud *et al.* 2020). The goal of this research was to gather and publish information on plants that have traditionally been utilized in Ringim to treat and control inflammation.

Materials and Methods

Study Area

Ethnobotanical study was carried out in Ringim Local Government Area which covered Ringim in Ringim district, Chai-chai in Chai-chai district, Gamoji in Sankara district, and Kyarama in Dabi district. Ringim local government has a population of 192,024 as of 2006 with an area of 1,057 km². The local government has the latitude and longitude at 12° 9.09 N 9° 9.73 E respectively (Figure 1). They are mainly Hausa and Fulani (nomadic). Their major occupations are farming, animal rearing, fishing, and hunting. The area is characterized mainly by two seasons dry (October-May) and wet (June-September) yearly but sometimes varies it depend (Zakariya *et al.* 2021).

Sampling and Interview sessions

The methods of non-random probability and expert sampling method were employed in this study (Awang *et al.* 2018). The people interviewed were principally a constitution of Traditional Medicine Practitioners or herbalist or traditional healers, elderly people with the claim of traditional plant knowledge, apprentices, and traditional birth attendants. The interview was conducted in local languages with an in-depth questionnaire as a guide.

Procedure for Data Collection

The data for this research were obtained from direct interviews with the local people, conducted from May 2016 – May 2018 in the Ringim community area. The verbal consent of the respondents was sorted. Important of the study were explained to them with aid of the administrative chief, district heads, and community elders. These key elders authenticate and affirm the respondents to be interviewed. Each of the respondents was visited two to three times to verify and have reliable data. In case of any discrepancy obtained between the information given before and those of successive visits on a particular plant, were considered unreliable and rejected. In accordance with conventional inquiry process, data was collected utilizing communicable dialects within the area.

Plants Collection and of Herbarium Specimen Deposition

Plants species recorded during the interview were collected individually in the field with the aid of respondents confirmed by the elderly people in the community. Plants with variation in their local names were avoided. Collected plants specimen were identified by a certification at Bioresources, National Research Institute for Chemical Technology (NARICT), Zaria, Kaduna State, Nigeria. The identified plant species were subsequently deposited in the herbarium of the research institute.

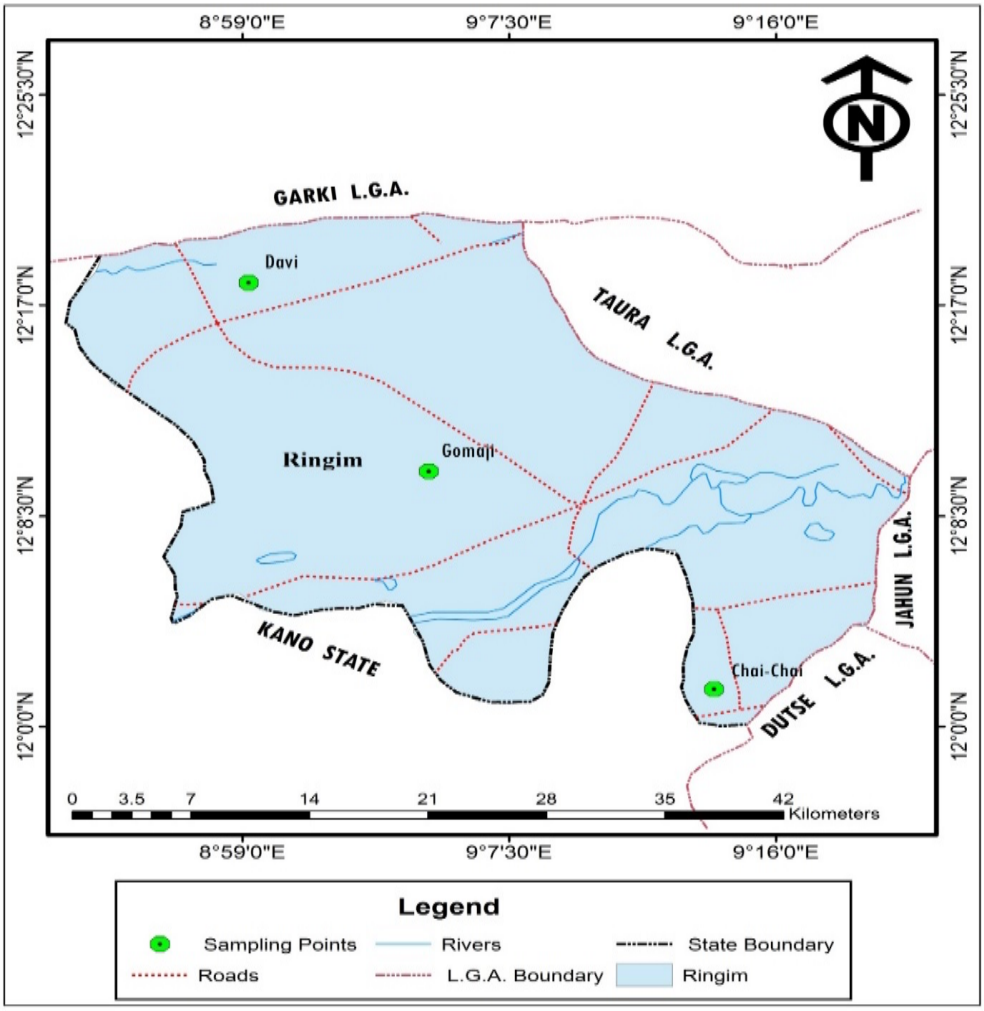

Figure 1. Map of the study area

Data analysis

The study employed a simple descriptive analysis for the collected ethnobotanical data to determine the frequencies and percentage based on the following information:

i. Socio-demographic information of Respondents (Mahmoud *et al.* 2020).
ii. Plant taxonomic information, mode of administration, mode of preparation, growth form and parts of plant (Awang *et al.* 2018).
iii. Quantitative data were computed based on the following indices:

a. To determine the relative importance of a certain plant species, Used Value was used, using the following formula:

$$UV = \sum Ui / N.$$

Where Ui is the total number of uses mentioned, and N denotes the total number of number of informants interviewed (Abdulrahman *et al.* 2018).

b. The relative frequency of citation (RFC) was used to assess the popularity of medicinal plant species. The above characteristic was utilized to determine the plant's relative popularity within a community.

$$RFC = Fc/N$$

where Fc is the number of informants who mentioned a certain plant species and N denotes the total number of informants interviewed (Abdulrahman *et al.* 2018).

c. Fidelity Level (FL) This measure was used to determine the ability of a plant species to treat a specific ailment. Using the equation below, this parameter was used to determine the ability of a certain plant species to cure inflammatory disease:

$$FL = Ns / N \times 100.$$

Where, Ns = the total number of respondents who identified a specific plant species for the treatment of specific diseases and N is the total number of respondents cited the plants.

Literature Search on Biological Evaluation of mentioned plants by the Respondents

To discover the *in vivo* and *in vitro* research on the mentioned plants by the respondents, a literature search was undertaken using Google Scholar, Scopus, and PubMed for pharmacological properties such as anti-inflammatory, antimicrobial, antioxidant, antibacterial, anticancer, and antiviral.

Results and Discussion

Sociodemographic information of the respondent s

The ethnobotanical was survey carried out in Ringim. Eighty-one respondents (81) were interviews. The study adopted purposive sampling. Sampling size is not needed. Similar methods were adopted in some ethnobotanical studies carried out by the previous researchers (Abdulrahman *et al.* 2018). There was no discrimination during the interview. All experienced people certified by the traditional rulers of the community were interviewed. 88.9% of the respondents interviewed were men and 11.1% are women respectively (Table 1). The dominancy of the men in the research is due to the culture and religion of the study area as said by the respondents. Similar, results were reported in the ethnobotanical studies carried out in Northern Nigeria (Abdulrahman *et al.* 2018). The majority of the respondents interviewed were found at the age of 30-49 years (55.6%), followed by 70 and above at 33.3% (Table 1).

Table 1. Demographic information of the Respondents interviewed

Parameters	Frequency	Percentage
Gender		
Male	72	88.9
Female	9	11.1
Age		
30-49	45	55.6
50-69	9	11.1
70- >	27	33.3
Education		
Primary education	15	18.5
Secondary education	9	11.1
Tertiary	4	4.9
Religious education	53	65.4

The dominancy of 30-49 years is a result of they are in their active stage they give more time especially, during the field collection. The majority of the respondents did not attend western education but rather they attended religious education from the age of four till date (65.5%) (Table 1). Only 18. 5% of the respondents attended primary school education while 11.1% secondary and 4.9% tertiary education respectively (Table 1). Same situation was reported in ethnobotanical studies of medicinal plants used in the treatment of hepatic ailments in Katsina Northern Nigeria (Kankara *et al.* 2018). Traditional healers (56.8%), farmers (30.9%), elderly people (8.6%), and traditional birth attendants (3.7%) were the statuses of the interviewed respondents (Figure 2). The following study is not in agreement with traditional medicinal studies carried out in Northern Nigeria; predominance of women was documented (Kankara *et al.* 2015). But the predominance was due to the fact that women are more concerned with the maternal healthcare system.

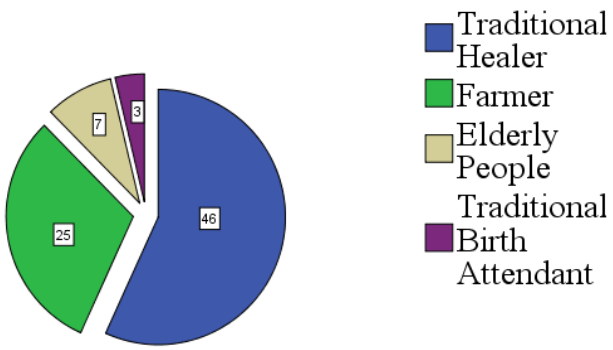

Figure 2. Occupational status of the respondents

The response of the respondent was computed concerning their community (Figure 3). Chai community was found to give the highest contribution with 34.6%, Ringim 33.3%, Gamoji 19.8%, and Kyarama 12.3 % respectively (Figure 3). This demonstrates that traditional medicinal herbs are being used effectively by all communities to control and improve their health.

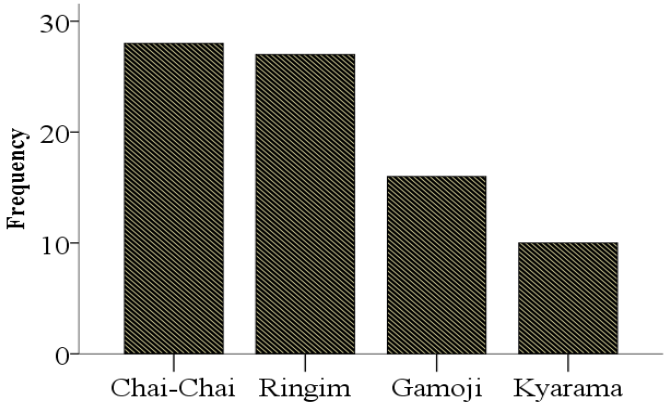

Figure 3. Contributions of zones in respect to medicinal plants documented.

Biodiversity of the documented plants

The study revealed 47 medicinal plant species, which were divided into 25 families (Figure 4). Species with the same local name were not collected to avoid any misidentification. The domination of the plant families in the flora was found as follows; Leguminosae (10 species), Malvaceae (4 species), Combretaceae (4 species), Anacardiaceae (2 species), Burseraceae (2 species), Euphorbiaceae (2 species), Meliaceae (2 species), Moraceae (2 species), Poaceae (2 species), Poaceae (2 species) and while the remaining families each with one species. There are three types of valuable flora in the region:trees, shrubs, and herbs (Table 2). Despite the loss of traditional culture on natural resources and climate change in the region and around the world, the study found that the region has a great diversity of wild plant species. Leguminosae is one of the most diverse and beneficial plant families. They are grown both in aquatic and in flatland (Abdulrahman *et al.* 2018). Members of this group range from shrubs, climbers, and trees which were similarly reported in the following study. The diversity of the plants documented in the study, shows how diverse the traditional medicinal practitioners are in the community. Whereby, the studies on medicinal used for the treatment of Malaria in ***Kafin Hausa*** reported only 15 species (Zakariya *et al.* 2021).

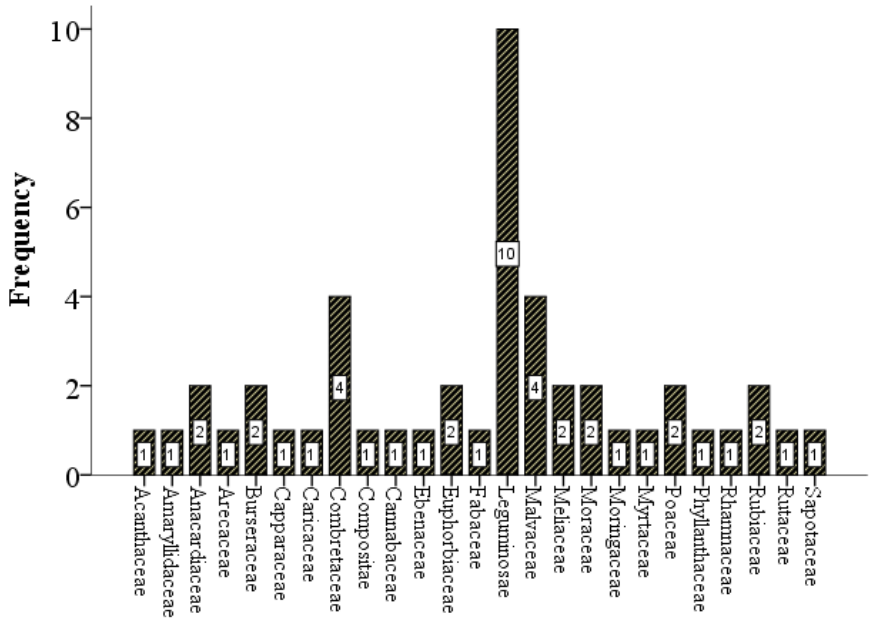

Figure 4. Family distribution of the documented plants in Ringim

Table 2. List of medicinal plants documented from the study

Family name	Scientific name	Common name (Hausa)	Major Other Diseases Treated	Part of the plant	Method administration	Method of preparations	Form and Domestication status	Voucher number
Acanthaceae	*Nelsonia canescens* (Lam.) Spreng.	Tsamiyar maharba	Anti-miseals	Stem bark	Bathing	Poultice	Shrub/Wild	0023
Amaryllidaceae	*Allium cepa* L.	Albasa	Cold related	Bulb	Oral, Dermal	Infusion	Herb/FUC	0031
Anacardiaceae	*Mangifera indica* L.	Mangwaro	Pile	Stem bark	Oral	Poultice	Tree/Wild	1944
Anacardiaceae	*Sclerocarya birrea* (A. Rich.) Hochst.	Lulu danya, Dawya	Diarrhoea	Stem bark	Oral, Dermal	Poultice	Tree/Wild	0041
Arecaceae	*Hyphaene compressa* H.Wendl.	Goruba	Dysentry	Fruits	Oral	Poultice	Tree/ Wild	0067
Burseraceae	*Boswellia ameero Balf.f.*	Ararrabi	Stomach upsate	Stem bark	Oral, Dermal	Poultice	Tree/Wild	0623
Burseraceae	*Commiphora africana* (A.R ich.) Endl.	Dashi	Cancer-related diseases	Steam bark, leaves	Oral	Decoction/ Decoction	Tree/Wild	2551
Capparaceae	*Maerua angolensis* DC.	Mandiwa, Chichiwa	Cancer related disease	Stam bark	Oral , Dermal	Poultice / Decoction	Tree/ Wild	5532
Caricaceae	*Carica papaya* L.	Gwanda	Yellow fever	Leaves	Oral, Bathing	Poultice	Tree/FUC	0078
Combretaceae	*Anogeissus leiocarpa* (DC.) Guill. Perr.	Marke	Pile and Haemorrhoid	Stem bark	Oral, Dermal	Poultice	Tree/ Wild	0061
Combretaceae	*Guiera senegalensis* J.F. Gmel	Sabara	Pile and Haemorrhoid	Stem bark, Root	Oral, Bathing	Poultice	Shrub/Wild	0071
Combretaceae	*Combretum micranthum* G. Don	Geza	Ulcer	Leaves	Oral, Bathing	Poultice	Shrub/Wild	6211
Combretaceae	*Combretum lamprocarpum* Diels	Kattakara, Talauniya	Parasitic stomach worm	Leaves	Oral	Poultice	Shrub/Wild	7445
Compositae	*Centaurea senegalensis* DC.	Kayar Rakumi	Burns, wounds	Whole plant	Bathing	Poultice / Decoction	Shrub/Wild	0322
Cannabaceae	*Celtis toka (Forssk.)* Hepper J.R.I. Wood	Zuwo, Dunki	Rheumatism/Malarial	Leaves, stem bark	Oral	Poultice	Tree/ Wild	4019
Ebenaceae	*Diospyros mespiliformis* Hochst. ex A. DC.	Kanya	Tooth ache	Stem bark	Oral	Decoction	Tree/Wild	0045
Euphorbiaceae	*Croton abaitensis Baill.*	Gasaya	Penis function stimulant	Leaves	Oral	Poultice	Shrub/Wild	0005
Euphorbiaceae	*Jatropha aceroides* (Pax K. Hoffm.) Hutch.	Bini da zugu, Mamulu	Constipation	Leaves	Oral	Poultice	Tree/Wild	0040
Fabaceae	*Albizia coriaria* Welw. ex Oliver	Katsari	Cancer	Leaves	Oral, Bathing	Poultice, infusion	Tree/Wild	0091
Leguminosae	*Tamarindus indica* L.	Tsamiya	Stomach upsate	Fruits	Oral	Infusion	Tree/Wild	0087
Leguminosae	*Acacia abbreviata* Maslin	Duwaduwa	Rheumatic fever	Stembark	Dermal	Decoction	Tree/Wild	0064
Leguminosae	*Acacia hockii* De Wild.	Dushe	Skin diseases	Stem bark	Dermal	Decoction	Shrub/Wild	2416
Leguminosae	*Aeschynomene uniflora* E.Mey.	Bagaruwar kasa	Body immune	Leaves	Dermal	Poultice	Herb/Wild	4561
Leguminosae	*Senna obtusifolia* (L.) H.S.Irwin Barneby	Tafasa	Skin	Leaves, whole plant	Dermal/Oral	Poultice / Decoction	Herb/wild	0233

Leguminosae	*Detarium beurmannianum* Schweinf.	Taura	Rheumatism	Stem bark	Dermal/Oral	Poultice / Poultices	Tree/Wild	0076
Leguminosae	*Mimosa pigra* L.	Kaidaji, Gombi	Diarrhoea/Tonic	Leaves	Oral	Poultice	Shrub/Wild	2623
Leguminosae	*Parkia biglobosa* (Jacq.) G. Don	Dorawa	Anti-measles	Stem bark	Dermal/Oral	Poultice / Decoction	Tree/Wild	0031
Leguminosae	*Senna acanthoclada* (Griseb.) H.S. Irwin Barneby	Majamfari	constipation	Whole plant	Oral	Poultice	Herb/Wild	8623
Leguminosae	*Senna singueana* (Delile) Lock	Runhu	Immune against skin diseases	Stem bark	Dermal	Poultices	Shrub/Wild/Village	3773
Malvaceae	*Hibiscus sabdariffa* L.	Yakuwa/ Zobo	Hypertension/ Diabetes	Flower	Oral	Poultice	Shrub/ FUC	0032
Meliaceae	*Azadirachta indica* A. Juss.	Maina, Darbejiya	Anti-malaria	Leaves	Oral	Poultice	Tree/ FUC	0020
Meliaceae	*Khaya senegalensis* (Desv.) A.J uss.	Madaci	Stomach pain	Stem bark	Oral	Poultice	Tree/ Wild	4167
Moraceae	*Ficus sycomorus* L.	Baure	Anti-epileptic	Stem bark	Oral	Poultice	Tree/ Wild	0110
Moraceae	*Ficus thonningii* Blume	Chediya, Shirinya	Dysentery	Stem bark	Oral	Poultice	Tree/Wild	2121
Moringaceae	*Moringa oleifera* Lam.	Zogale	Hypertension/ Diabetes	Leaves, Whole plant	Oral	Poultice	Tree/FUC/Wild	0993
Myrtaceae	*Psidium guajava* L.	Gwaiba	Hypertension/ Diabetes/ Malaria	Leaves/ Whole plant	Oral/ Dermal	Poultice / Decoction	Shrub/FUC/Wild	2311
Malvaceae	*Adansonia digitata* L.	Kuka	Body immune	Leaves	Oral	Poultice	Tree/Wild	0075
Malvaceae	*Ceiba acuminata* (S. Watson) Rose	Rimi	Stomach pain	Stem bark	Oral	Poultice	Tree/ Wild	1517
Malvaceae	*Sterculia setigera* Delile	Kukuki	Respiratory/ snake bites	Leaves/stem bark	Oral/Dermal	Poultice / Decoction	Tree/ Wild	0017
Poaceae	*Urelytrum giganteum* Pilg.	Jema	Stomach disorder	Leaves	Oral	Poultice	Herb/Wild	0722
Poaceae	*Pennisetum advena* Wipff Veldkamp	Hura	Anti-diarrhea	Leaves	Oral	Poultice	Herb/Wild	1897
Phyllanthaceae	*Phyllanthus abditus* G.L. Webster	Zogalen kuda	Ringworm	Leaves	Oral	Poultice	Tree/Wild	2901
Rhamnaceae	*Ziziphus spina-christi* (L.) Desf.	Magarya	Stomach pain/ Chest	Leaves	Oral/ Dermal	Poultice / Decoction	Tree/Wild	9342
Rubiaceae	*Mitragyna diversifolia* (Wall. ex G. Don) Havil.	Giyayya	Skin infection	Leaves	Dermal	Decoction	Herb/Wild	4115
Rutaceae	*Citrus aurantiaca* Swingle	Lemon tsami	Malaria fever	Leaves	Bathing	Infusion	Tree/FUC	1101
Rubiaceae	*Spermacoce suaveolens* (G. Mey.) Kuntze	Alkamar tururuwa	Eczema	Whole plant	Dermal	Decoction	Herb/Wild	1153
Sapotaceae	*Vitellaria paradoxa* C.F. Gaertn.	Kadanya	Skin infection	Leaves	Oral/Dermal	Poultice / Decoction	Tree/ Wild	0060

Note:S/N = Serial Number, FUC = Field Under Cultivation.

Determination of the popularity and effectiveness of the documented plant species

Quantitative ethnobotany improves the chances of identifying promising pharmacologically significant plants in the community (Awan *et al.* 2021). Used Value, relative frequency citations, fidelity level and information consensus factors were reported as good index for determination of usefulness and effectiveness of plant species in a particular community (Kankara *et al.* 2015). Quantitatively all the 47 reported medicinal plants were found to be popular (Table 3). In Ringim, plants with an RFC value of 0.9 are the most popular, while those with an FL value of 80% are the most effective in the treatment and management of inflammation (Table 3).

Table 3. Popularity and effectiveness of Documented plant Species based on the RFC and FL.

Species name	UV	RFC	FL%
Nelsonia canescens (Lam.) Spreng.	0.06	0.6	80
Allium cepa L.	0.04	0.7	91
Mangifera indica L.	0.06	0.6	98
Sclerocarya birrea (A.Rich.) Hochst.	0.07	0.9	87
Hyphaene compressa H. Wendl.	0.02	0.8	80
Boswellia ameero Balf.f.	0.02	0.6	87
Commiphora africana (A. Rich.) Endl.	0.07	0.9	77
Maerua angolensis DC.	0.04	0.7	66
Carica papaya L.	0.02	0.9	77
Anogeissus leiocarpa (DC.) Guill. Perr.	0.07	0.8	90
Guiera senegalensis J.F. Gmel	0.02	0.6	87
Combretum micranthum G.Don	0.04	0.9	87
Combretum lamprocarpum Diels	0.02	0.6	80
Centaurea senegalensis DC.	0.07	0.7	90
Celtis toka (Forssk.) Hepper J.R.I. Wood	0.02	0.7	87
Diospyros mespiliformis Hochst. ex A. DC.	0.07	0.8	77
Croton abaitensis Baill.	0.02	0.9	87
Jatropha aceroides (Pax K. Hoffm.) Hutch.	0.06	0.6	80
Albizia coriaria Welw. ex Oliver	0.02	0.7	91
Tamarindus indica L.	0.07	0.6	80
Acacia abbreviata Maslin	0.02	0.7	91
Acacia hockii De Wild.	0.07	0.6	98
Aeschynomene uniflora E. Mey.	0.04	0.9	87
Senna obtusifolia (L.) H.S. Irwin Barneby	0.07	0.6	80
Detarium beurmannianum Schweinf.	0.06	0.8	87
Mimosa pigra L.	0.07	0.8	77
Parkia biglobosa (Jacq.) G. Don	0.07	0.9	87
Senna acanthoclada (Griseb.) H.S. Irwin Barneby	0.04	0.6	77
Senna singueana (Delile) Lock	0.06	0.6	90
Hibiscus sabdariffa L.	0.02	0.9	87
Azadirachta indica A. Juss.	0.07	0.8	87
Khaya senegalensis (Desv.) A. Juss.	0.06	0.6	80
Ficus sycomorus L.	0.07	0.9	90
Ficus thonningii Blume	0.02	0.7	66
Moringa oleifera Lam.	0.07	0.9	87
Psidium guajava L.	0.04	0.6	66
Adansonia digitata L	0.06	0.6	90
Ceiba acuminata (S. Watson) Rose	0.02	0.7	90
Sterculia setigera Delile	0.04	0.8	87
Urelytrum giganteum Pilg.	0.06	0.6	80
Pennisetum advena Wipff Veldkamp	0.06	0.9	91
Phyllanthus abditus G.L.Webster	0.06	0.8	98
Ziziphus spina-christi (L.) Desf.	0.04	0.6	87
Mitragyna diversifolia (Wall. ex G. Don) Havil.	0.02	0.9	80
Citrus aurantiaca Swingle	0.02	0.7	87
Spermacoce suaveolens (G.Mey.) Kuntze	0.02	0.9	77
Vitellaria paradoxa C.F.Gaertn.	0.07	0.6	87

Part of the plant, method of preparation and administration for the treatment of inflammation

Leaves were reported the most utilised part (42.6%), followed by Stem bark (37%), whole plants (11.1%), fruits (3.7), then bulb, flower, and root (1.9%) respectively (Figure 5). The respondents as shown preference in the usage of the leaves and bark stem for the treatment of inflammation and its related cases. The respondents attributed their preference of the following plant parts due to their effectiveness, easier collection, and avoiding the extinction of the species by the collection of the plant root. Previously it was reported that leaves and barks stems are the ideal areas for secondary metabolite manufacturing and storage, which are responsible for the plant's biological characteristics (Abdulrahman *et al.* 2018). Similarly, ethnobotanical studies of traditional medicinal plants used by birth attendants in Côte d'Ivoire justified the leaves and bark stem preference due to the ease with which the collection of parts and easily regenerated (Koman et al., 2021). Only three methods of preparation of medicinal plants were reported in the following studies; decoction (28.1), infusion (7%), and poultice (64.9) (Figure 6). The following methods were used due to the nature of the disease reported by the respondents. The decoction was known as the fastest means of extracting the component of the plant parts (Koman et al., 2021). Respondents claimed dermal medication is higher than the oral method. As they believed most of the causes are external. The study is in agreement with the study of Arunachal Pradesh, India on traditional medicinal plants used for anti-inflammatory (Namsa et al., 2009).

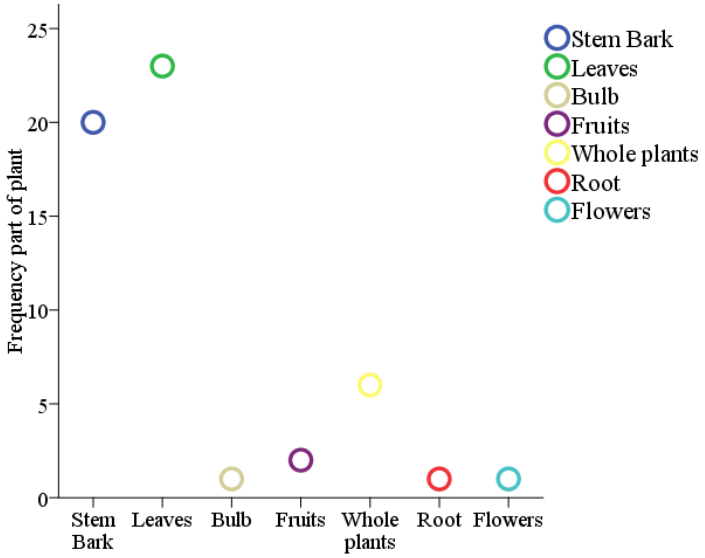

Figure 5. Parts of the plants used for the management of Inflammation in Ringim

Diagnosis and dosage regimen of inflammation

It depends on the traditional herbalist on the diagnosis of the causes of the inflammation. The majority of the respondents (83%) asked the patients if they are feverish, check their tongues, asked whether the inflammation was a result of minor or serious accidents to ascertain the cause of the inflammation. Only (17%) of the respondents give medication by mere observation. Generally, the medication is applied thrice a day in the affected area daily until fully recovered. It depends on the magnitude of the infection, if it is serious, bathing, oral and dermal medication is prescribed. For the preparation of the medication, water, holy water (Zamzam), honey, black seed oil, garlic oil are used as diluents for the preparation of the medication. None of the respondents reported the negative side effect of the prescribed medication. Some studies reported water as the means of diluent of traditional medicinal plants (Namsa et al., 2009).

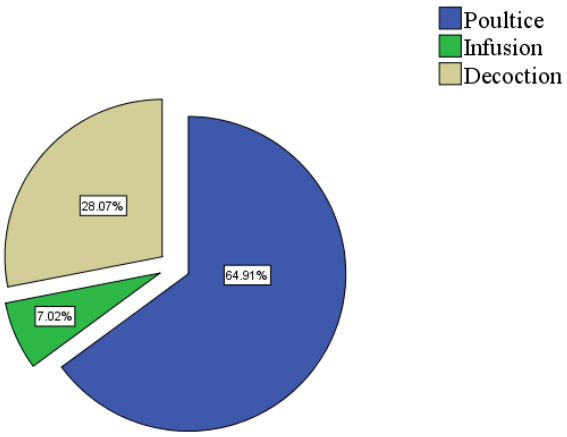

Figure 6. Methods of Preparation of the plant parts used for the management of Inflammation in Ringim

Literature review on biological evaluation of mentioned plants by the respondents

According to the literature, the majority of the plants mentioned by respondents in this survey have been evaluated *in vitro* or *in vivo,* and some cases both. This adds to the study's conclusions' believability. This has been shown (Table 4). Based on these findings, more research is needed to determine the safety, standardization, and dosing regimen for these extracts and compounds from medicinal plants. Extensive pre-clinical and clinical trials aimed at developing new and/potent anti-inflammatory drugs should also be conducted on these plants, as their reported use in traditional medicine and high/potent activities demonstrated scientifically make them a promising source of new anti-inflammatory drugs candidates. No scientific reports with regards to *H. compressa, C. lamprocarpum, C. toka, C. abaitensis, J. aceroides, A. coriaria, S. acanthoclada, C. acuminata, U. giganteum, P. advena, P. abditus, C. aurantiaca and S. suaveolens.* Because the respondents claim that the aforementioned plants are effective in the treatment of inflammatory and related illnesses, pharmacological study on them is required.

Conclusion

The utilisation of medicinal plants by the traditional herbalist of Ringim for treatment and management of inflammation is properly documented. The present study revealed the people of Ringim, Jigawa state, Northern part of Nigeria rely on traditional medicine to treat various ailments. The study also revealed both the young and aged people of the community are the custodian of traditional knowledge to treat ailments. Men are the most knowledgeable of traditional medicinal plants in the community. The study will serve as an avenue for the exploration of this untapped knowledge for herbal product formulations, new modern drugs, and monographs of medicinal plants in Northern Nigeria and Nigeria at large.

Table 4. Literature review on Biological Evaluation of mentioned plants by the Respondents

Species	**Activity**	**Results**	**Literature Cited**
Nelsonia canescens (Lam.) Spreng.	Anti-inflammatory	The study's findings suggest that it possesses anti-inflammatory properties in animal models ranging from mild to acute.	(Mohaddesi, Ashok, Acharya, Shukla)
	Anti-acetylcholinesterase and antioxidant activities	With a 55.62 % inhibition, extract was shown to have the best anti-acetylcholinesterase effect. 3 ethylbenzothiazoline-6-sulphonate was found to have a radical cation scavenging capacity of 56.20 mg.	(Ouattara et al., 2013)
	Hepatoprotective Activity	The plant possesses dose-dependent hepatoprotective activity, with a dose of 500 mg/kg having a significant effect in reducing paracetamol-induced damage, which was comparable to the protective effect of the conventional drug Silymarin (100 mg/kg, b.w.).	(Dasgupta *et al.* 2012)
	Cytotoxicity	The extracts' cytotoxicity and selectivity against the HeLa and SiHa cell lines suggest that this species could be exploited as a lead in cervical cancer treatment.	(Nabèrè et al., 2019)
Allium cepa L.	Antioxidants	Antioxidant activity was higher than the typical standard used.	(Akwu, Naidoo, Singh, 2019)
	Biological activity	Both extracts were found to have antiproliferative properties, with glioblastoma cells demonstrating the most significant reduction in cellular proliferation.	(Fredotović et al., 2017)
	Antioxidant	The antioxidant properties of the Allium extracts studied were found to be varied but fascinating. Total phenolic content was found to be substantially associated to these properties.	(Fredotović et al., 2017)
	Antioxidant/Anti-inflammatory	The volatile sample, water sample I, and water sample II all showed anti-inflammatory activity with a dose-related response in the lipoxygenase inhibitor screening experiment.	(Takahashi Shibamoto, 2008)
Mangifera indica L.	Anti-inflammatory	Mango polyphenols have been demonstrated to benefit intestinal health by regulating microorganisms like Lactobacillus plantarum that are involved in the generation of bioactive gallotannin metabolites.	(Kim et al., 2021)
	Anti-inflammatory	There was a significant reduction in plasma levels of pro-inflammatory cytokines, nitric oxide, and	(RamPravinKumar Dhananjayan, 2021)

		malondialdehyde; and the expression levels of mRNA of induced nitric oxide synthase and intercellular adhesion molecule of animals treated with 0.2 and 0.4 g/kg of EEMI in comparison to disease control.	
	Anti-inflammatory	Inhibition of IL-4 and IL-5 cytokines, as well as IgE levels and cell proliferation, in bronchoalveolar lavage fluid and lymphocyte culture supernatant resulted in a considerable reduction in airway inflammation surrounding arteries and bronchi.	(Rivera et al., 2011)
Sclerocarya birrea (A. Rich.) Hochst.	Anti-inflammatory	In a time-dependent manner (SB, 500 mg/kg p.o.) reduced rat paw oedema caused by subplantar injections of fresh egg albumin.	(J. A. Ojewole, 2003)
	Antimicrobial	When compared to the negative control of 1% DMSO, the extract preventing the synthesis of violacein, with a suppression of 70.19 percent. The inhibitory impact of ascorbic acid, which was used as a control, is much stronger.	(Paré *et al.* 2021)
	In vitro	exhibited decreased cytotoxicity in normal human dermal fibroblasts, implying that it could be used as a cancer-selective agent.	(Russo et al., 2018)
Hyphaene compressa H. Wendl.	Nill	Nill	Nill
Boswellia ameero Balf.f.	Antioxidant	At 200 g/mL, the antioxidant activity of the essential oil was determined to be IC_{50} =175.2 g/mL.	(N. A. A. Ali et al., 2008)
	Antimicrobial	Antibacterial activity was discovered in Gram-positive bacteria, particularly multi resistant Staphylococcus strains. The most activity was seen in the methanolic extract.	(Mothana Lindequist, 2005)
Commiphora africana (A. Rich.) Endl.	Antioxidative, anti-inflammatory	*In vitro*, it showed significant antioxidant and anti-inflammatory activities. Polar extracts reduced iron levels by acting as radical scavengers (III). Prostaglandin production was significantly decreased	(Compaoré *et al.* 2016)
	Anti-inflammatory and Pain in Rodents	The hydro-ethanolic (stem-bark) extract has a substantial anti-inflammatory effect (<0.05) and prevents acetic acid-induced abdominal constriction in mice.	(Ezekiel *et al.* 2010)
	hypoglycaemic	Three doses of the extract were given (100, 200, and 400 mg/kg). Blood glucose levels were significantly reduced	(Goji *et al.* 2009)

		after one day of medication with a dose of 400 mg/kg. Blood glucose levels were significantly lower after 5 and 7 days of therapy with dosages of 200 and 400 mg/kg when compared to control.	
Maerua angolensis DC.	Antioxidant activity	Butanoic fractions had the best anti-FRAP (535.961 µmol AAEAC/g of fraction), anti-ABTS (155.868 µmol TEAC/g of fraction), and anti-DPPH (81.109 mol QEAC/g of fraction) activity.	(Meda *et al.* 2013)
	Analgesic Property	The extract dose of 3 and 10 mg/kg had no effect on the animals' motor coordination in the rotarod test, showing that no central depressive effect was present.	(Iliya Woode, 2014)
Carica papaya L.	Thrombocytosis and Anti-inflammatory	In thrombocytopenic rats, a high dose of mature leaf concentrate substantially significant at P <0.05.	(Gammulle et al., 2012)
	Anti-inflammatory and immunomodulatory	The extracts significant at p <0.05 reduced paw oedema in the carrageenan test. Similarly, the extract lowered the amount of granuloma produced, decreasing it from 0.58 to 0.22	(Owoyele *et al.* 2008)
	Antioxidant and Anti-Inflammatory	Both hydrogen peroxide and superoxide anion have been discovered to be efficient antioxidants. The effect of plant extracts on T cells and imDC was confirmed by a dose-dependent decrease in TNF- production.	(Sagnia et al., 2014)
Anogeissus leiocarpa (DC.) Guill. Perr.	Anti-nociceptive and anti-pyretic	At p<0.05, doses of 200 and 400 mg/kg reduced produced pain and pyrexia in a way that was equivalent to the positive controls.	(Adejoh *et al.* 2019)
	Wound healing	The wound area shrank with time, indicating that the formulations were successful in treating the wounds. By the 15th day, the mixture of 100 mg/mL aqueous extract and 10% w/w powdered ointment of A. leiocarpus had healed completely, identical to the typical antibiotic (2% w/w penicillin).	(Barku *et al.* 2013)
	Antioxidant and Cytotoxic	When compared to the standard, the results showed significant antioxidant activity. None of the bioactive fractions were found to be cytotoxic in the cytotoxicity tests.	(Eltayeb Ali, 2016)
Guiera senegalensis J.F. Gmel	Gastroprotective	In all tests employed, the leaf extract (50, 100, and 200 mg/kg significantly reduced the ulcer at P <0.05.	(Akuodor et al., 2013)

	Anti-hepatitis B	Isolated compounds such as quercetin and myricetin-3-O-rhamnoside. HBsAg and HBeAg production were both suppressed to about 60% and 62 percent, respectively.	(Parvez *et al.* 2020)
	Antiplasmodial, analgesic and anti-inflammatory	Extracts were found to be safe at 600 mg/kg body weight in mice, with an LD50 of 1100 mg/kg bw. Only the methanolic fraction had an antiplasmodial effect, but the ethyl acetate and hexane fractions were ineffective.	(Jigam *et al.* 2011)
Combretum micranthum G. Don	Anti-inflammatory	The extract (50, 100 mg/kg) significantly reduced the development of carrageenan-induced oedema in rats at $P < 0.05$.	(Olajide *et al.* 2003)
	Nephroprotective activity	Reduced CP-induced kidney damage markers, oxidative stress, and histological abnormalities at all doses, resulting in restored renal function.	(Kpemissi et al., 2019)
	Anti-hyperglycaemic	Of the doses studied, the extract dose of 100 mg/kg was the most effective. It has a hypoglycaemic and anti-diabetic effect similar to that of a standard drug at 0.6 mg/kg glibenclemide.	(Chika Bello, 2010)
Combretum lamprocarpum Diels	Nill	Nill	Nill
Centaurea senegalensis DC.	Antibacterial	The antibacterial effectiveness of extracts was discovered to have growth inhibition zones ranging from 15 to 31 mm.	(Idris *et al.* 2019)
Celtis toka (Forssk.) Hepper J.R.I. Wood	Nill	Nill	Nill
Diospyros mespiliformis Hochst. ex A. DC.	Antimalarial	It have antimalarial properties against resistant *Plasmodium berghei* infection in mice, as well as increased cell viability and mito-protection, and they are not toxic.	(Olanlokun *et al.* 2021)
	Antimalarial	In the curative and suppressive tests, the extract (50-200 mg/kg has a strong dose-dependent impact against the parasite, as well as a repository effect at high dosages at 100 and 200 mg/kg	(Adzu Salawu, 2009)
	Inflammatory effects	According to this study, the extracts exerts immunomodulatory effects in infected mice, limiting malaria parasite replication and so protecting liver cells.	(David et al., 2021)
Croton abaitensis Baill.	Nill	Nill	Nill

Jatropha aceroides (Pax K. Hoffm.) Hutch.	Nill	Nill	Nill
Albizia coriaria Welw. ex Oliver	Nill	Nill	Nill
Tamarindus indica L.	Anti-inflammatory	The findings showed that the extract significantly reduced carrageenan-induced paw edema in rats at P< 0.01.	(Suralkar *et al.* 2012)
	Anti-inflammatory	In an acute inflammation model, the aqueous extract to have good anti-inflammatory action.	(Udupa, Rathnakar, Udupa, 2007)
	Anti-inflammatory and anti-oxidant	With lower IC_{50} values, the stem bark extract was a stronger scavenger of both DPPH radicals and hydrogen peroxide than the root extract. Both extracts demonstrated dose-dependent reductions in edema in the anti-inflammation test, similar to the conventional medicines utilized.	(Borquaye *et al.* 2020)
Acacia abbreviata Maslin	Antioxidant and hepatoprotective	With an EC50 of 6.3 g/mL in DPPH and 19.15 mM FeSO4 equivalent/mg sample in the FRAP experiment, the extract showed strong antioxidant activity. The extract significantly reduced the activities of ALT, AST, and GGT by 11 percent, 35.7 percent, and 65 percent, respectively.	(Sobeh et al., 2018)
Acacia hockii De Wild.	Anti-inflammatory	Normal diclofenac reduced inflammation by 1.11% to 4.9 %, whereas stem bark extract reduced inflammation by 0.6 percent to 5.38 %.	(Kamau *et al.* 2016)
	Antipyretic	The stem bark extract lowered rectal temperature in pyretic rats by 0.62-3.8%, while aspirin reduced rectal temperature by 0.63-3.1%.	(Kamau, Nthiga, Safari, et al., 2016)
	Antimicrobial and Antioxidant	The extracts' minimum inhibitory doses ranged from 0.625 mg/mL to 5 mg/mL. With an inhibitory proportion of up to 95.88 %, both extracts substantially inhibited sporulation. The antioxidant activity of the extracts ranged from 6 to 96 %. The extracts contain antibacterial and antioxidant properties.	(Lagnika *et al.* 2016)
Aeschynomene uniflora E. Mey.	Anti-inflammatory	Toxicity tests revealed that no one died in any of the groups, even when the dose was increased to 5000 mg/kg. The dose of 1000 mg/kg showed more activity than the Control, followed by 250 mg/kg, and ultimately 500 mg/kg, indicating efficacy.	(Anas, Ambi, Zainab, Jajere, Umar, 2018)

	Antimicrobial	Both the methanol and petroleum ether extracts have a MIC of 30 mg/mL against *Candida stellatoidea*. Minimum bactericidal/fungicidal concentrations (MBC/MFC) of the extracts ranged from 15 mg/mL to 60 mg/mL.	(Achika, Ndukwe, Ayo, 2016b)
	Antimicrobial	Spectroscopic investigation revealed the structure of the isolated molecule to be 3, 22E-Stigmasta-5, 22-dien-3-ol (stigmasterol) (IR, 1D-NMR). On some bacteria, the isolated chemical demonstrated strong antibiotic action.	(Achika *et al.* 2016a)
Senna obtusifolia (L.) H.S. Irwin Barneby	Anti-inflammatory	Obtusifolin reduced Mmp3, Mmp13, and Cox2 expression to levels comparable to or greater than celecoxib therapy. Obtusifolin also reduced collagenase activity as well as PGE2 levels.	(Nam et al., 2021)
Detarium beurmannianum Schweinf.	Nill	Nill	Nill
Mimosa pigra L.	Analgesic And Anti-Inflammatory	In 30, 60, 120, and 150 minutes, oral dose of 250 mg/kg produced significantly analgesic action at $P<0.05$. The two dosages tested 250 mg/kg and 500 mg/kg inhibited rat paw edema by 42.60 and 49 %, respectively, at 150 minutes, compared to 63.20 % in the positive control group.	(Shorinwa, Ubele, Ukwueze, 2015)
	Antihyperglycemic and antinociceptive	The findings not only back up the plant's traditional use for decreasing blood sugar and pain relief, but they also suggest that it could be studied further for the creation of antihyperglycemic and pain-relieving drugs.	(Toma et al., 2012)
	analgesic and anti-inflammatory	The crude extract of the plant was found to have an anti-inflammatory effect in the tested mice at doses of 100 and 200 mg/kg body weight when compared to the control.	(Akhter *et al.* 2018)
Parkia biglobosa (Jacq.) G. Don	Analgesic and anti -nflammatory	When mice were given the abdominal writhing test, the results showed that this extract had a substantial analgesic effect. This action was accompanied by a weaker anti-inflammatory effect than the analgesic effect.	(Kouadio et al., 2000)
	Probiotic	These findings show that the Bacillus cultures used to manufacture "daddawa" would make excellent probiotic candidates, and that they might be employed in both	(Nwagu et al., 2020)

		animal and human formulations to promote consumer health.	
	Cardioprotective	ISO produced MI in infarcted rats, which was marked by a substantial rise in MDA ($P < 0.001$), biochemical abnormalities, cardiac hypertrophy, and histological alterations. HAE significantly ($P < 0.001$) reduced the induction of all of these defects in pre-treated rats. May have cardioprotective qualities against ISO-induced MI, according to these data.	(Adi et al., 2013)
Senna acanthoclada (Griseb.) H.S. Irwin Barneby	Nill	Nill	Nill
Senna singueana (Delile) Lock	Antioxidant, Hepatoprotective, Antiapoptotic	It significantly reduced elevated AST (aspartate aminotransferase) and total bilirubin levels. Apoptosis was suppressed by the extract, which boosted cytoplasmic Bcl-2 expression.	(Sobeh et al., 2017)
	Anti-nociceptive	Antinociceptive effects were also shown to be stronger in the 400 mg/kg extract at $p \leq 0.05$. The leaves may have analgesic qualities.	(Hishe *et al.* 2018)
	Antinociceptive	At 100 and 200 mg/kg, antinociceptive effectiveness was much higher at P 0.01. This study backs up anecdotal evidence for the usage of the plant in the treatment of painful illnesses.	(Kariuki, 2012)
Hibiscus sabdariffa L.	Antioxidant and anti-inflammatory	LPS-induced NO production in RAW 264 is dose-dependently decreased. The 7 cell indicates that the extract may have anti-inflammatory properties.	(Zhen et al., 2016)
	Antinociceptive, anti-inflammatory and antidiarrheal	When compared to a control group of mice, the extract significantly reduced writhing ($P < 0.01$). In xylene-induced ear oedema model mice, the extract greatly prevented ear edema production in a dose-dependent manner as compared to the blank control ($P < 0.01$). The extract showed significant antidiarrheal activity against castor oil-induced diarrhea in rats at dosages of 250 and 500 mg/kg body weight, lowering the frequency of stools and increasing the mean latent length ($P < 0.01$).	(M. K. Ali *et al.* 2011)
	Anti-inflammatory	The extract dramatically reduced writhing in mice when compared to a control group ($P < 0.01$). When compared	(Shen *et al.* 2016)

		to the blank control in xylene-induced ear edema model mice, the extract significantly reduced ear edema development in a dose-dependent manner ($P < 0.01$). At dosages of 250 and 500 mg/kg body weight, the extract showed considerable antidiarrheal efficacy against castor oil-induced diarrhea in rats, reduced the frequency of stools and increasing the mean latent length ($P< 0.01$).	
Azadirachta indica A. Juss.	Anti-inflammatory, pro-apoptotic, and anti-proliferative.	Our findings reveal that neem extract has a considerable impact on proinflammatory cell signalling and apoptotic cell death pathways, allowing us to learn more about the mechanisms involved.	(Schumacher *et al.* 2011)
	Anti-inflammatory	Despite the fact that all of the extracts were anti-inflammatory, chloroform extract was the most effective against paw edema (53.25 % inhibition).	(Umar et al., 2014)
	Anti-nociceptive and anti-inflammatory	According to the findings, mice given a 100 mg kg1 dose of CTCE + azadiradione had considerable anti-nociceptive and anti-inflammatory effects. This study rationalized tribal people's ethnomedicinal use of the herb to treat wounds, burns, and injuries.	(Ilango *et al.* 2013)
Khaya senegalensis (Desv.) A. Juss.	Anti-inflammatory and Antinociceptive	The extract decreases ear edema in mice in a dose-dependent manner and is significant at $P < 0.05$. It also significantly decreased granuloma formation and paw edema in rats at $P < 0.05$.	(Kolawole *et al.* 2013)
	Antioxidant	Antioxidant capability was found in the plant's leaves, stem bark, and roots, with IC_{50} values of 46, 37, and 64 l, respectively.	(Atawodi *et al.* 2009)
	Chemo preventive on human cancer	The extract has anti-proliferative, anti-inflammatory, and pro-apoptotic effects on HT-29, HCT-15, and HCA-7 cells, according to our findings.	(Androulakis et al., 2006)
Ficus sycomorus L.	Anti-inflammatory	The findings back up the plant's long history in medicine and emphasize the value of leaves in the search for new anti-inflammatory chemicals to treat sickle cell disease.	(Ramdé *et al.* Guissou, 2015)
	Antioxidative and antibacterial	At 0.13 mg/mL and 0.25 mg/mL, respectively, Ficus sycomorus latex showed the lowest minimum inhibitory concentrations (MIC) against *Staphylococcus aureus* and	(Ramde-Tiendrebeogo et al., 2012)

		Escherichia coli and antiradical activity of an IC_{50} of 9.60 0.02 µg/mL.	
		Some fractions were shown to be efficient against brine shrimp larvae and the organisms examined, the most effective being FS1-1.	(Mudi, Muhammad, Musa, Datti, 2015)
Ficus thonningii Blume	Anti-inflammatory,	The activity of the extract are comparable to aspirin and significant at $P < 0.05$ when compared to Tween 80.	(Coker *et al.* 2009)
	Antiplasmodial activity	Both 3D7 and Dd2 did not demonstrate any promising antiplasmodial activity. With the exception of the methanolic extract, which had a minor antiplasmodial action with inhibitory concentration and selectivity index of 9.61 µg/mL and 11.16, respectively.	(Koukouikila-Koussounda et al., 2013)
	Antioxidant	In terms of preventive and curative activities, the extract demonstrated a non-significant rise in SOD, Catalase, and glutathione.	(Pougoue *et al.* 2020)
Moringa oleifera Lam.	Antinociceptive and Anti-Inflammatory	The extract (10, 30, and 100 mg/kg) demonstrated significant antinociceptive and inflammatory effectiveness, which was dose-dependent, in all of the tests used at $P < 0.05$.	(Sulaiman et al., 2008)
	Cytotoxic and Anti-Inflammatory	WSMoL were shown to be non-toxic to mammalian cells; however, the aqueous seed extract and cmol were found to be cytotoxic to immune cells, which could explain the extract's immunosuppressive characteristics.	(Araújo et al., 2013)
	Antioxidant and anti–inflammatory	indicated a moderate amount of antioxidant activity. Plant extract had a high anti-inflammatory impact that was comparable to diclofenac sodium, a common anti-inflammatory medicine.	(Alhakmani, Kumar, Khan, 2013)
Psidium guajava L.	Anti-Inflammatory and analgesic	Inhibited fresh egg albumin-induced acute inflammation (edema) and thermally and chemically induced nociceptive pain in rats in a dose-dependent and significant at $p< 0.05$-0.001.	(J. Ojewole, 2006)
	Anti-Inflammatory	The IC_{50}s for leaves and fruit oils were 3.59 and 8.11 mg/mL, respectively, while the IC_{50}s for deoxyribose were 12.64 and 42.78 g/L.	(El-Ahmady *et al.* 2013)

Adansonia digitata L	Hepatotoxicity	Acetaminophen greatly improved liver function disturbances. Total protein, total bilirubin, ALP, ALT, and AST were used to assess liver function.	(Hanafy *et al.* 2016)
	Pro-Inflammatory	These data suggest that MEAD inhibits the generation of anti-inflammatory iNOS, which could be linked to the elimination of peroxyl radicals and hence the inhibition of IB-mediated NF-B activation.	(Ayele et al., 2013)
Ceiba acuminata (S. Watson) Rose	Nill	NILL	NILL
Sterculia setigera Delile	Anti-inflammatory	It possesses anti-inflammatory qualities, according to in vitro and in vivo research, proving its folklore use.	(Henneh et al., 2018)
	Hepatoprotective Activity	The extracts reduced serum levels of alanine amino transferase (ALT), aspartate amino transferase (AST), total protein, albumin (ALB), bilirubin concentration, and alkaline phosphatase, which demonstrated a minor protective effect (ALP).	(Abdelrahman, 2016)
		At 1000 and 7.813 g/mL, the extracts displayed promising antioxidative effects on DPPH, with significant scavenging effects of 80.64 % and 18.3 %, respectively.	(Muhammad, Idris, Mamman, 2020)
Urelytrum giganteum Pilg.	Nill	NILL	NILL
Pennisetum advena Wipff Veldkamp	Nill	Nill	Nill
Phyllanthus abditus G.L.Webster	Nill	Nill	Nill
Ziziphus spina-christi (L.) Desf.	Anti-inflammatory	Nuclear p65 protein levels were reduced as a result of treatment. Root and seed extracts inhibited NF-B-DNA binding.	(Kadioglu et al., 2016)
	Anti-inflammatory	These findings imply that ZSCLE, via eliciting anti-inflammatory and anti-oxidant effects, could be used as a treatment agent for sepsis.	(Dkhil *et al.* 2018)
	Anti-inflammatory	Natural antioxidants that can help prevent the progression of many chronic diseases.	(Alhakmani *et al.* 2014)
Mitragyna diversifolia (Wall. ex G. Don) Havil.	Antidiarrheal activity	The ethanolic bark extract showed significant at $P < 0.05$ antidiarrheal effects on gastrointestinal motility in the barium sulfate milk model and castor oil-induced diarrheal model in rats.	(Uddin *et al.* 2009)
	Acetylcholine esterase inhibitory effects	All of the isolates were tested for showed considerable inhibitory activity, with IC_{50} values of 4.1, 5.2, 10.2, and 10.3 M respectively.	(Cao et al., 2013)

	In-vitro antioxidant and anti-inflammatory activity	The anti-inflammatory activity of both parts of the plant extract was comparable to that of the common anti-inflammatory drug diclofenac.	(Alhakmani et al., 2014)
Citrus aurantiaca Swingle	Nill	NILL	NILL
Spermacoce suaveolens (G. Mey.) Kuntze	Nill	NILL	NILL
Vitellaria paradoxa C.F. Gaertn.	Biopharmaceutical	Antioxidant testing demonstrated that maceration extraction extracts have a significant antioxidant activity. The enzymatic activity of HAE-derived extracts was found to be more significant.	(Sinan et al., 2020)
	Anti-inflammatory	based on the biological effects of triterpene acetate and cinnamate esters, has a significant supply of anti-inflammatory and anti-tumor promoting chemicals	(Akihisa et al., 2010)
	Anti-inflammatory and anti-arthritic activity	After 1 hour, VPME (75 mg/kg) inhibited carrageenan-induced inflammation significantly (66.67 percent).	(Foyet et al., 2015)

Declarations

List of abbreviations:RFC = Relative Frequency of Citation, FL = Fidelity Level, ICF = Information Consensus Factor, FUC = Field Under Cultivation, AA = Anas Abba, MDB =Mahmoud Dogara Abdulrahman

Ethics approval and consent to participate: The research was conducted with the approval of the Jigawa State Wing of the local traditional herbalist association, a non-governmental organization. Oral consent was obtained from the informants prior to the interview. The informants were fully informed of the study's objectives and willingly agreed to participate.

Consent for publication: Not applicable.

Competing interests: There are no competing interests.

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Authors contributions:AA Design the research MDA Brought the idea. All authors contributed equally to analysis and drafting the manuscripts.

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