TRADITIONAL AND INTEGRATIVE MEDICINE

Trad Integr Med, Volume 8, Issue 1, Winter 2023

Review

Ethnopharmacological Survey of Medicinal Plants Used in the Management of Skin-Related Conditions in Ilorin, North-Central, Nigeria

Mansurat B. Falana[1]*, Quadri O. Nurudeen[2], Saoban S. Salimon[2], Ibrahim B. Abubakar[3]

[1]Department of Biological Sciences (Microbiology Unit), Al-Hikmah University, Ilorin, Nigeria
[2]Department of Biological Sciences (Biochemistry Unit), Al-Hikmah University, Ilorin, Nigeria
[3]Department of Biochemistry, Kebbi State University of Science and Technology, Aliero, Kebbi State, Nigeria

Received: 13 Nov 2021 **Revised:** 31 May 2022 **Accepted:** 16 Jun 2022

Abstract

The abundance of plants with medicinal values has been of great impact on the skincare industry in Nigeria. However, proper documentation of plants with skincare values has not been made. Hence, this study was aimed at surveying the traditional medicinal values of some commonly used plants for the management of skin conditions by herbal practitioners in Ilorin metropolis. Ethnobotanical and demographic information of willing respondents was obtained on the most commonly used medicinal plants via semi-structured questionnaires and oral interviews. The names of the plants were further confirmed in the world flora online (www.worldfloraonline.org). A total of 57 plants species representing 30 families, were reported by 62 respondents including males (40%) and females (60%) designated as herbs sellers (32%), traditional medicine practitioners (16%), farmers (8%), housewives (11 %) and Herb sellers/traditonal medicine practitioners (33%). Their knowledge sources include inheritance (40%), training (24 %), and a combination of inheritance and training (36%). Euphorbiaceae was the most cited (11 %) plant family, the leaves were the most cited (48%) plant part used, crush to extract juice was the most widely used (51%) method of preparation, and topical application on the affected spot was the most reported (43%) method of administration. The plants mentioned in this survey were reported to have applications against psoriasis, eczema, boils, acne, measles, dandruff, rashes, and wounds. General skin conditions represented the most commonly mentioned (14%) skin condition; while mastitis was the least mentioned (1%) condition. Also, the highest (0.923) informant consensus factor (ICF) was mentioned for insect bites; while the least (0.263) ICF was mentioned for general skin conditions. This study documented some of the medicinal plants that have been used to treat various skin-related conditions most of which have been mentioned in available scientific pieces of literature.

Keywords: Dermatophytes; Eczema; Ethnobotanical; Psoriasis; Skincare

Introduction

An intact skin serves as a physical barrier that provides the first line of defense against infections. Skin diseases, a medical state in which there is internal dysfunction presented with signs and symptoms such as hardening of the skin and papules [1], constitute about 34% of all ailments found in rural people [2]. Universally, skin conditions are the fourth leading cause of non-lethal disease burden commonly associated with disability and poor quality of life [3].

Skin and soft tissue infections (SSTI), generally classified as purulent infections (such as abscesses, carbun-

Citation: Falana MB, Nurudeen OO, Salimon SS, Abubakar IB. **Ethnopharmacological Survey of Medicinal Plants Used in the Management of Skin-Related Conditions in Ilorin, North-Central, Nigeria**. Trad Integr Med 2023;8(1):56-76.

*Corresponding Author: Mansurat B. Falana
Department of Biological Sciences (Microbiology Unit), Al-Hikmah University, Ilorin, Nigeria
Email: bolman4ever@yahoo.com

cles, and furuncles) or non-purulent infections (such as cellulitis, erysipelas, and necrotizing fasciitis), are diverse groups of infections caused by microorganisms such as *Staphylococcus aureus* and *Streptococcus pyogenes* [4]. It can be primary which occurs when an organism invades otherwise healthy skin or secondary, which occurs when an organism invades already damaged skin due to factors such as immunocompromised cases, recent exposure to antibiotics [5], or following an underlying disease such as diabetes mellitus [6].
According to Dalgard *et al*. [7], a large number of people with skin conditions are depressed probably due to low self-esteem and being hesitant to socialize. The World Health Organization, 2001 reported that skin diseases are a global burden as it is associated with mortality rates of 20,000 in Sub-Saharan Africa [8]. Also, certain skin conditions (such as scabies and tinea) that are recurrent and very difficult to treat, can have a significant impact ranging from a high cost of treatment, a decrease in skin elasticity, permanent scars, and emotional and psychological distress [9,10]. Common disorders of the skin are dermatitis, eczema, pruritus, skin wounds, pimples, boils, and blisters [11]. Conventionally, non-purulent infections are treated with antibiotics; while a surgical approach is preferred in severe cases [5]. Pruritus is a common skin condition reported among the elderly that leads them to seek dermatologic intervention [12]. In 2017, the Nigerian Association of Dermatologists reported that there was an inadequate number of dermatologists to treat patients with skin conditions as the ratio of dermatologists to patients (1:1,770,000) was significantly low [13]. Thanks to nature, there is an avalanche of herbs, which are not only useful as foods but have long been used in different ways for the treatment of various ailments including disorders of the skin. Hence, this study was aimed at the identification and compilation of some medicinal plants used in the treatment of skin-related diseases, towards the preservation of historical knowledge in Ilorin, the North-Central Zone of Nigeria.

Materials and Methods

Study Area

This survey was carried out in Ilorin Metropolis, Kwara State, Nigeria. Ilorin is located within *Latitude* 8° 29' 47 and 90" North and *Longitude* 4° 32' 31 and 70" East study (Figure 1). The study area was selected due to its safe temperate climate with enormous fast-growing plants of valuable natural skincare application among the rural populace as well as among the traditional medicine practitioners.

Respondents

The targeted respondents were farmers, herb sellers, herbalists/traditional medical practitioners, housewives, and aged people who have used medicinal plants for skincare in their lifetime within Ilorin, Nigeria.

Data Collection

This study was conducted from February 2019 to July 2020, via a semi-structured questionnaire comprising two parts, 1 and 2. Part 1 contained the demographic information (age, gender, educational background, marital status, number of children, years of practice) about the respondents; while part 2 contained characteristics of the plants used in the treatment of various skin conditions and the therapeutic implications of those plants. An inventory was obtained of the characteristics of plants and further statistical analysis was carried out. The useful plants of West Tropical Africa, Nigeria, the Weeds Nigeria Trees, and Medicinal plants of Nigeria booklet were used as guides for identifying the plant species [14,15]. The local names use, mode of preparation, route of administration, and the skin conditions addressed were documented.
Before the administration of questionnaires to the respondents, there was a tete-a-tete with the respondents to enlighten them on the growing interest of orthodox medicine in medicinal plants, the continuous research into their valuable compositions, their continuous application in the development of new drugs against many ailments as well as their consent to publish.

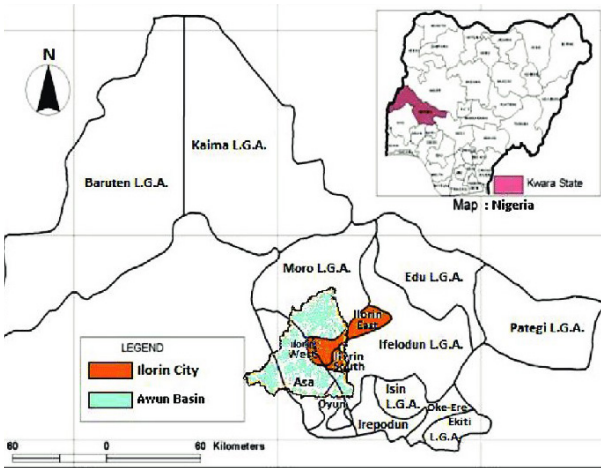

Figure 1. Map of Kwara State with the study area (Ilorin) highlighted

Collection and identification of the plants

Samples of all plants mentioned during the study were obtained and identified taxonomically at the Herbarium Unit, Department of Plant Biology, University of Ilorin, Ilorin, Nigeria where voucher numbers were obtained and specimens were deposited. Afterward, the names of the plants were verified in

the world flora online (www.worldfloraonline.org).

Analysis of Data

The frequencies and percentages of the demographic data of the respondents were computed using descriptive statistical analysis. The relative frequency of citation (RFC), fidelity level (FL), and informant consensus factor (ICF) values were computed.

Relative Frequency of Citation

The relative importance of a particular species based on the number of times the species was mentioned was determined [16] using the expression; RFC = NC / NR × 100
NC is the number of times a particular species was cited by respondents and NR is the total number of the respondents.

Fidelity Level

The potentiality of each plant against a specific skin condition and its favorable use among other plants were established [16] using the mathematical expression; FL = Csc/Csr × 100
Csc represents the frequency of citation of a specific species against a particular skin condition and Csr is the total number of citations of that species among all respondents.

Informant Consensus Factor

This determines the consensus among respondents on their citations on the use of a particular species against a specific skin condition. The mathematical expression described by Mesfin et al. [17] was adopted for the computation of ICF; $ICF = (N_{ur} - N_t) / N_{ur} - 1$
N_{ur} represents the number of citations for a specific skin condition and Nt is the number of species reported to cure that skin condition.

Results

Sociodemographic Distribution

Sixty percent of the respondents were females (60%) and twenty-five males (40%) with fifty Nigerians (81%) and twelve foreigners (19%) (Table 1). Also, the respondents within the age range of < 40 years (35%) and > 40 years (65%) fall across various practice specifications, including herb sellers (32%), traditional medicine practitioners (16%), farmers (8%), housewives (11%) and Herb sellers/traditonal medicine practitioners (33%). The knowledge source of the respondents includes inheritance (40%), training (24%), and a combination of inheritance and training

Table 1. Demography of respondents

S/N	Parameters	Specification	Frequency of respondents	Percentage of frequency (%)
1	Nationality	Nigerian	50	81
		Non-Nigerian	12	19
2	Religion	Islam	42	68
		Christianity	20	32
		Traditional	0	0
3	Sex	Female	37	60
		Male	25	40
4	Age	< 40 years	22	35
		> 40 years	40	65
5	Educational Background	Primary	22	36
		Secondary	28	45
		Tertiary	12	19
6	Practice specification	Herb sellers	20	32
		Traditional Medical Practitioners (TMP)	10	16
		Herb sellers /TMP	20	33
		Farmers	5	8
		Housewives	7	11
7	Knowledge source	Inheritance	25	40
		Training	15	24
		Training and Inheritance	22	36

(36%) (Table 1).

Plant Family

Fifty-seven (57) species of medicinal plants belonging to 30 families were reportedly used for the treatment and management of various skin conditions in Ilorin, Nigeria (Table 2). Euphorbiaceae was the most commonly mentioned (11%) family; while only one species each was mentioned for Crassulaceae, Gnetaceae, Solanaceae, Lauraceae, Rutaceae, Moraceae, Arecaceae, Guttiferae, Plumbaginaceae, Liliaceae, Moraceae, Sapotaceae, Loganiaceae, and Myrtaceae (Table 3).

Table 2. A catalog of some medicinal plants used for treating skin conditions in Ilorin

S/N	Botanical name	Local name	Common name	Family	VN	NC	NC (%)	FC (%)	R
1	*Citrus aurantifolia* (Christm)	Osan-wewe	Lime	Rutaceae	UILH/1059	30	5%	48	1
2	*Vitellaria paradoxa* (C. F. Gaertn)	Igi ori	Shea tree nut	Sapotaceae	UILH/1276	22	3%	35	2
3	*Azadirachta indica* (A. Juss)	Dogonyaro	Neem	Meliaceae	UILH/860	21	3%	34	3
4	*Moringa oleifera* (Lam.)	Ewe ile	Moringa	Moringaceae	UILH/1060	20	3%	32	4
5	*Vernonia amygdalina* (Del)	Ewuro	Bitter leaf	Asteraceae	UILH/972	18	3%	29	5
6	*Allium sativa* (Linn)	Ayu	Garlic	Liliaceae	UILH/1209	18	3%	29	5
7	*Ocimum gratissimum*	Efinrin	Sweet Basil	Lamiaceae	UILH/954	18	3%	29	5
8	*Mentha piperita*	Ewe minti	Mint leaf	Lamiaceae	UILH/922	18	3%	29	5
9	*Aframomum melegueta*	Atare	Alligator pepper	Zingiberaceae	UILH/1166	18	3%	29	5
10	*Calotropis procera* (Aiton)	Bomubomu	Giant milk weed	Asclepiadeceae	UILH/1001	16	2%	26	10
11	*Citrullus colocynthis* (Linn) Schrad.	Bara	Wild gourd, Apple	Cucurbitaceae	UILH1054	15	2%	24	11
12	*Zingiber officinale* Roscoe	Atale	Ginger	Zingiberaceae	UILH/1083	15	2%	24	11
13	*Elaeis guineensis Jacq.*	Ope	Oil palm tree	Arecaceae	UILH/880	15	2%	24	11
14	*Momordica charantia* L.	Ejinrin	Balsam pear	Cucurbitaceae	UILH/963	15	2%	24	11
15	*Spigelia anthelmia*	Paran pupa	Worm weed	Loganiaceae	UILH/1074	15	2%	24	11
16	*Syzygium aromaticum*	Kanafuru	Clove	Myrtaceae	UILH/1107	15	2%	24	11
17	*Laganaria breviflorus* (Benth.)	Tagiri	Christmas Melon	Cucurbitaceae	UILH/992	14	2%	23	17
18	*Picralima nitida* (Stapf) T. Durand & H. Durand	Abeere	Akuamma plant	Apocynaceae	UILH/846	14	2%	23	17
19	*Cymbopogon citatus* Stapf. (DC)	Ewe tea	Lemongrass	Poaceae	UILH/1406	14	2%	23	17
20	*Euphorbia heterophylla* L.	Egele	Fire plant	Euphorbiaceae	UILH/1198	13	2%	21	20

21	*Bryophyllum pinnatum* (Lam). Oken	Ewe abamo-da	Miracle leave	Crassulaceae	UILH/909	12	2%	19	21
22	*Merremia dissec-ta* (Jacq.)	Alamo	Alamo vine	Convolvulaceae	UILH/1380	12	2%	19	21
23	*Phyllantus amarus* Schum. &Thonn.	Eyin olobe	Gale of wind	Euphorbiaceae	UILH/1051	12	2%	19	21
24	*Nauclea latifolia* Smith	Egbesi	Nuclea	Rubiaceae	UILH/506	12	2%	19	21
25	*Carica papaya* Linn.	Ibepe	Pawpaw	Lamiaceae	UILH/967	12	2%	19	21
26	*Plumbago zeylanica* L.	Inabiri	Ceylon leadwort/ wild leadwort	Plumbaginaceae	UILH/1374	11	2%	18	26
27	*Xylopia aethiopica* (Dunal) A. Rich.	Eeru	Ethopian pepper	Annonaceae	UILH/1089	10	2%	16	27
28	*Cassia alata* (L.) Roxb.	Asunwon	Candle bush, craw-craw plant, acapu-lo, ringworm bush, or ringworm plant	Fabaceae	UILH/1069	10	2%	16	27
29	*Persea americana* (Mill)	Eero igba	Avocado pear	Lauraceae	UILH/747	10	2%	16	27
30	*Annona senegalensis* (Pers.)	Abo	African custard Apple	Annonaceae	UILH/1098	10	2%	16	27
31	*Psorospermum febri-fugum* Spach	Legun-oko	Christmas berry	Guttiferae	UILH/1402	10	2%	16	27
32	*Khaya grandifoliola* C.D.C.	Oganho	African mahogany	Meliaceae	UILH/910	10	2%	16	27
33	*Euphorbia laterifola* Schum. &Thonn.	Enu opiri	African mahogany	Euphorbiaceae	UILH/1268	10	2%	16	27
34	*Parquetina nigrescens* Afzel.	Ogbo	African parquetina	Asclepiadaceae	UILH/003	10	2%	16	27
35	*Ricinus commu-nis* Linn.	Eso lara	Castor bean	Euphorbiaceae	UILH/1196	10	2%	16	27
36	*Olax subscorpioidea* Oliv.	Ifon	Olax, Stinkant forest	Olacaceae	UILH/722	10	2%	16	27
37	*Curcuma longa* Linn	Laali pupa	Tumeric	Zingiberaceae	UILH/1105	10	2%	16	27
38	*Xylopia aethiopica* (Dunal) A. Rich.	Edun Alamo	Ethiopian pepper, grains of selim	Annonaceae	UILH/1089	9	1%	15	38
39	*Bambusa vulgaris* Schrad. ex Wendl	Oparun	Bamboo	Poaceae	UILH/714	9	1%	15	38
40	*Piliostigma thionnigii* (Schumach.) Milne-Redh.	Abafe	Camel's foot, mon-key bread, Rhode-sian bauhinia	Fabaceae	UILH/1085	9	1%	15	38
41	*Anogeissus leiocarpus* (DC) Guill and Perr.	Ayin	African birch	Combretaceae	UILH/937	8	1%	13	41
42	*Solanum macrocapon* (Linn.)	Igba	Egg plant	Solanaceae	UILH/1045	8	1%	13	41
43	*Xylopia villosa* Chipp.	Eeru awonka	Ground graminces	Annonaceae	UILH/1207	8	1%	13	41

44	*Acacia nilotica* (Linn.)	Booni	Acacia/Egyptian mimosa	Fabaceae	UILH/916	8	1%	13	41
45	*Rauvolfia vomitoria* Afzel.	Asun feyeje	Devil peppers	Apocynaceae	UILH/981	8	1%	13	41
46	*Mitracarpus villosus* (Sw.) DC.	Irawo	African or green borreria	Rubiaceae	UILH/1182	8	1%	13	41
47	*Bridelia atroviridis* (Müll.Arg.)	Arasado	Rare forest bridelia	Euphorbiaceae	UILH/1025	8	1%	13	41
48	*Tetrapleura tetraptera* Schum. &Thonn.	Aiden	Aidan tree	Fabaceae	UILH/1131	7	1%	11	48
49	*Olax subscorpioides* Oliv.	Ifon	Bread fruit	Olacaceae	UILH/722	7	1%	11	48
50	*Euphorbia unispina* N.E.Br	Oro adete	Cactus	Euphorbiaceae	UILH/858	7	1%	11	48
51	*Ageratum conyzoides* L.	imi esu	Whiteweed	Asteraceae	UILH/853	6	1%	10	51
52	*Gnetum africanum* Welw.	Jenfoko	African jointfir	Gnetaceae	UILH/568	5	1%	8	52
53	*Terminalia glaucescens* Planch. ex Benth.	Idi odan	Tropical carpet grass	Combretaceae	UILH/1039	5	1%	8	52
54	*Ficus exasperate* Vahl	Ipin	Sandpaper tree	Moraceae	UILH/628	5	1%	8	52
55	*Caesalpinia bonduc* (L.) Roxb.	Ayo	Bonduc nut	Leguminosaea	UILH/1108	5	1%	8	52
56	*Ipomoea asarifolia* (Desr.) Roem. & Schult.	Gboro-ayaba	Ginger leaf-morning glory	Convolvulaceae	UILH/1120	5	1%	8	52
57	*Erythrophleum suaveolens* (Guill. & Perr.) Brenan	Obo	Ordeal tree, sasswood tree	Fabaceae	UILH/1309	3	0%	5	57

KEY – VN: Voucher number, NC: Number of citations, FC: Frequency of citation, R: Ranking

Plant Parts

Based on the survey, leaves were the most commonly used part (48%); while the least mentioned parts (1 % each) are bulbs, rhizomes, a combination of plant parts 'leaves and root' and 'leaves, seeds, roots and fruit pulp' (Table 4).

Informant Consensus Factor of Skin Conditions

Of the eighteen categories of skin conditions mentioned in the survey, the most commonly treated (14%) condition was 'general skin conditions'; while mastitis was the least treated (1%) condition. Also, the highest ICF (0.923) was mentioned for insect bites; while the least ICF (0.263) was mentioned for general skin conditions (Table 5).

Mode of preparation

The survey revealed that the most commonly employed method of preparation of the herbal remedy is crushing to extract juice (51%), followed by decoction (39%), oil extraction from seeds (5%), mill seeds to powder (3.3%); while marsh fruit pulp to paste was the least method (1.7%) employed in the herbal treatment (Figure 2).

Mode of administration

The survey revealed that the most commonly employed mode of administration (Figure 3) of the herbal remedy is by topical application (51%) on the affected part, followed by bathing (23%), a combined means of topical application and bathing (19%), oral means by drinking (5%) while least mode of administration is by a combined means of oral and topical means (2%).

Discussion

Plants and plant products have been used by traditional

Table 3. Percentage occurrence of family names of the medicinal plants

S/n	Family name	Frequency	Frequency of occurrence (%)
1	Asteraceae	2	4
2	Crassulaceae	1	2
3	Euphorbiaceae	6	11
4	Annonaceae	3	5
5	Fabaceae	5	9
6	Gnetaceae	1	2
7	Combretaceae	2	4
8	Solanaceae	1	2
9	Olacaceae	2	4
10	Lauraceae	1	2
11	Rutaceae	1	2
12	Apocynaceae	2	4
13	Convolvulaceae	2	4
14	Cucurbitaceae	3	5
15	Poaceae	2	4
16	Zingiberaceae	3	5
17	Moraceae	1	2
18	Arecaceae	1	2
19	Rubiaceae	2	4
20	Guttiferae	1	2
21	Meliaceae	2	4
22	Plumbaginaceae	1	2
23	Liliaceae	1	2
24	Lamiaceae	3	5
25	Moringaceae	1	2
26	Sapotaceae	1	2
27	Loganiaceae	1	2
28	Myrtaceae	1	2
29	Olacaceae	2	4
30	Asclepiadaceae	2	4
		57	100%

+

societies due to the general belief in their affordability, safety, and availability. However, dissemination of information on medicinal plants from generation to generation had mainly been by oral means, which is slow and may not adequately preserve the information [162]. Thus, this study was concerned with the revival of interest in the conservation of folkloric knowledge on medicinal plants via the preservation of valuable documentation and their dissemination from generation to generation.

The skin, being the largest organ plays a significant immunological role as a physical barrier to environ-

Table 4. Plant parts used for the treatment of skin conditions

S/N	Parts used	Frequency	Frequency of occurrence (%)
1	Bulb	1	1
2	Fruit	7	10
3	Leaves	33	48
4	Rhizome	1	1
5	Roots	11	16
6	Seeds	5	7
7	Stem bark	5	7
8	Root and stem bark	2	3
9	Leaves and flower	2	3
10	Leaves and root	1	1
11	Leaves, seeds, roots, fruit pulp	1	1
		69	100%

Table 5. Informant consensus factor of skin conditions treated using the plants

S/N	Skin condition	Frequency	Frequency of occurrence (%)	Informant consensus factor
1	Measles	13	12	0.56
2	General skin conditions	15	14	0.26
3	Ringworm	9	8	0.73
4	Arthritis	2	2	0.5
5	Antiaging	4	4	0.4
6	Eczema	10	9	0.67
7	Wound healing/sore	10	9	0.39
8	Poliomyelitis	2	2	0.8
9	Acne	6	5	0.71
10	Itching	8	7	0.7
11	Scabies	3	3	0.6
12	Insect bite	2	2	0.92
13	Pox (smallpox and chickenpox)	9	8	0.64
14	Alopecia	4	4	0.73
15	Mastitis	1	1	0.33
16	Psoriasis	2	2	0.86
17	Jaundice	2	2	0.5
18	Dehydration	2	2	0.88
19	Dermatitis	4	4	0.83
		108	100%	

mental stressors. Hence, the need to keep its condition intact. Most skin and soft tissue conditions are characterized by acute or chronic wounds arising from exposure to sunlight, infections by microorganisms, or poor skin-care practices like the use of wrong cosmetic products [163]. Previous estimates indicated that nearly 6 million people suffer from chronic wounds worldwide [164,165]. However, most studies on medicinal plants have overlooked the use of natural products as a source for the care of skin conditions. In this study, the diversity in gender involvement may be an indication that females are more concerned with the healthcare of the family and that skincare is more of a female responsibility than males. In corroboration to this is the study conducted by Borokini et al. [166], which related that 58.1% of female respondents in the study of traditional medicines used for women's health in Oyo State, Nigeria. Also, the majority of the respondents being Nigerians may contribute to the knowledge of medicinal plants commonly found in this part of the world. The age distribution (65%) of the respondents, being older than 40, suggests that older people have more knowledge of medicinal plants than the younger generation. Thus, the urgent need for folkloric knowledge preservation over generations while also serving as an indication of the acerbic nature of the younger generation towards the acquisition of traditional knowledge [167]. The majority of the respondents acquired their knowledge via inheritance, thus, offering a glimmer of hope that the knowledge of medicinal plants would not fade away over generations. This is contrary to the report that traditional medicine has been associated with confidentiality [168], probably due to fear of being diminished in the race to exploit their commercial values.

The most commonly mentioned families, Euphorbiaceae, Fabaceae, Annonaceae, Cucurbitaceae, Zingiberaceae, and Lamiaceae have been reported as the most commonly sourced family in treating skin diseases in Akwa Ibom State [169]. The studies of Abbasi et al. [170] also previously mentioned the use of similar families in traditional cosmetics. Pharmacological activities of Asteraceae and Rutaceae were reported to include antibacterial, and antifungal properties [171]. A similar survey on medicinal plants has also mentioned the families Fabaceae, Euphorbiaceae, and Malvaceae more frequently [172,173].

The roots, leaves, stem bark, and twigs of medicinal plants are used in the management of wounds, acute respiratory tract infections, stomach infections, fever, tuberculosis, dysentery, giardiasis, malaria, trypanosomiasis, yellow fever, jaundice, and pathogenic microbial infections [174]. The leaves were the most commonly (48%) mentioned part which might be attributed to their role as the center of biosynthesis of different metabolites containing many bioactive principles with good medicinal potency [175,176].

According to this survey, the methods (decoction, pulp to paste, milling to powder, crush to extract juice, and oil extraction) employed in preparing the plants is supported by the report that the active principle of plants is often extracted through, infusion, decoction, and tincture [177]. In line with this study, Abdillahi and Van Staden [178] and Batawila [179] reported that decoction is the most widely employed method of preparation of medicinal plants. Also, treatments of skin conditions using herbal medicines may be by oral or topical means. In this survey, most treatments (51%) are achieved by topical means. This is in disagreement with previous studies that have shown that most medicinal plants are most frequently administered orally [180].

According to the ethnomedicinal reports given in this study, most of the plants mentioned have been previously used individually or in combination with other plants as good agents in the treatment of many skin-related conditions [181]. The present review, therefore, provides information, for documentation, on the medicinal plants that are used in this study area for the management of skin-related conditions.

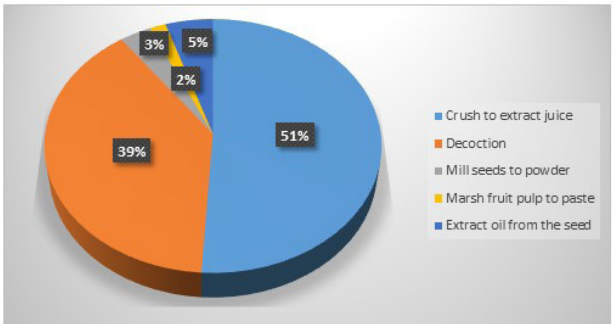

Figure 2. Mode of preparation of medicinal plants used for treating skin conditions

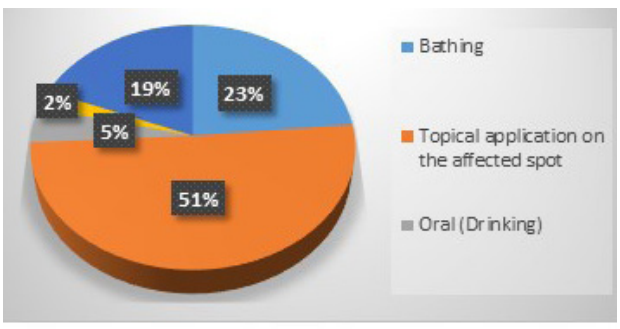

Figure 3. Mode of administration of medicinal plants for treating skin conditions

Table 6. Medicinal plants used by respondents for treating skin conditions

S/N	Botanical name	Plant parts used	Type of skin condition treated	Mode of preparation	Route of administration
1	*Vernonia amygdalina*	Leaves	Measles, ringworm, wound healing	Crush to extract juice	Topical application on the skin 2 times daily
2	*Bryophyllum pinnatum*	Leaves	general skin conditions	Crush to extract juice	Topical application on the skin
3	*Euphorbia heterophylla*	Leaves	Ringworm/Measles	Crush to extract juice	Topical application on the skin
4	*Xylopia aethiopica*	Seeds	general skin conditions	Crush seeds to powder, and mix with shea butter	Topical application on the affected spot
5	*Tetrapleura tetraptera*	Root	general skin conditions including measles	Decoction	Bathing and drinking
6	*Senna Alata or Cassia Alata*	Leaves	Ringworm, eczema	Decoction	Mix with black soap and use in bath
7	*Gnetum africanum*	Leaves	general skin conditions	Decoction, crush to extract juice	Bathing
8	*Terminalia glaucescens*	Root	wound healing and anti-aging	Decoction	Mix with black soap and use in bath
9	*Anogeissus leiocarpus*	Bark	All kinds of skin conditions, antiaging	Decoction	Mix with black soap and use in bath
10	*Solanum macrocapon*	Leaves	Suitable for numerous skin infections	Crush to extract juice	Apply to the affected part, mix with soap
11	*Olax subscorpioides*	Root and stem bark	Management of numerous skin conditions	Decoction	Apply to the affected part, mix with soap
12	*Persea americana*	Fruit	Soothing numerous skin conditions, antiaging	Crush	Apply to the affected part
13	*Ageratum conyzoides*	Leaves and flowers	eczema, poliomyelitis, measles, wound, rashes	Decoction, crushing	The water to be used for bathing, apply the juice to the affected part or mix with black soap for bathing
14	*Xylopia villosa*	Leaves and flower	Rashes	Crush and combine with black soap	Bathing
15	*Xylopia aethiopica*	Fruit	Measles	Mill to powder	Mix with black soap and use to bath
16	*Acacia nilotica*	Fruit	Pox, alopecia, mastitis, wound healing	Crush the fruit to make a paste	Apply all over the affected part and leave to dry
17	*Citrus aurantifolia*	Fruit	Ifo	Crush to extract the juice	Apply on the affected area or mix with black soap for bathing
18	*Rauvolfia vomitoria*	Root and stem bark	Treats numerous skin conditions e.g., Psoriasis, wound healing	Decoction	For bathing

19	*Merremia dissecta*	Leaves	Skin lesions, rashes, scabies, and other skin diseases	Crush to extract juice	Apply leaf juice to the affected part
20	*Citrullus colocynthis*	Fruit	Alopecia	Mill to powder	Mix with shea butter and apply to the affected part
21	*Annona senegalensis*	Leaves	Skin conditions, wound healing, chickenpox	Decoction	Apply on the affected part
22	*Bambusa vulgaris*	Leaves	Skin conditions, wound healing, chickenpox	Crush the leaves to extract juice	Apply leaf juice to the affected part, can also be mixed with black soap for bathing
23	*Zingiber officinale*	Rhizome	Measles, jaundice	Crush the rhizome to extract juice	Rub the juice all over the body. Drinking 1 tablespoon daily
24	*Phyllantus amarus*	Leaves	Sores, rashes, ringworm, eczema	Crush the leaves to extract juice	
25	*Ficus exasperata*	Leaves	Ringworm	Crush the leaves to extract juice	Apply the juice to the affected part
26	*Elaeis guineensis*	Seeds	measles, rashes	Extract oil from the seed	Topical application on the skin 2 times daily
27	*Euphorbia unispina*	Stem	eczema wound healing	Decoction	Apply on the affected part
28	*Mitracarpus villosus*	Leaves	eczema, rashes	Crush to extract juice	Apply the juice to on the affected area
29	*Momordica charantia*	Leaves	Wound healing, antiaging, insect bite, rashes	Crush to extract juice or make a decoction	Apply the juice to the affected area, or mix with black soap for bathing. Can also be taken orally
30	*Nauclea latifolia*	Leaves and roots	Chickenpox	Decoction	Apply on the affected part
31	*Laganaria breviflorus*	Fruit	Great for the skin and hair generally	Crush to make a paste of the fruit	Apply topically on the affected part. Great as a conditioning agent for the hair
32	*Psorospermum febrifugum*	Root	Skin itching, acne, sores, scabies	Decoction	Apply topically on the affected part
33	*Khaya grandifoliola*	Stem bark	Jaundice/chickenpox	Decoction	Drinking and topical application on the affected part
34	*Plumbago zeylanica*	Leaves and roots	all kinds of skin conditions	Decoction	Apply topically on the site
35	*Euphorbia laterifolia*	Leaves	Itching	Crush to extract juice	Apply topically on the site
36	*Piliostigma thonningii*	Leaves	Itching	Decoction	Drinking
37	*Parquetina nigrescens*	Leaves	Measles and chickenpox	Crush to extract juice	Apply the juice to the affected part
38	*Bridelia atroviridis*	Leaves	Wound healing, measles, rashes	Crush to extract juice	Apply the juice to the affected part
39	*Ricinus communis*	Seeds	Alopecia, dehydration, skin rashes, wound, warts, itching,	Extract oil from the seed	Apply as cream on the affected part

40	*Allium sativa*	Bulb	Ringworm, eczema, scabies, alopecia	Crush the bulb to extract the juice	Apply the juice to the affected part
41	*Caesalpinia bonduc*	Leaves	Chickenpox	Crush to extract juice	Apply on the affected part
42	*Ocimum gratissimum*	Leaves	Insect bite	Crush to extract juice	Place the crushed leaves on the affected spot
43	*Mentha piperita*	Leaves	Itching, acne, dermatitis, psoriasis, ringworm, eczema	Crush to extract juice	Apply directly on the affected part or mix with black soap for bathing
44	*Ipomoea asarifolia*	Leaves	Itching, acne, dermatitis, eczema	Crush to extract juice	Apply directly on the affected part or mix with black soap for bathing
45	*Moringa oleifera*	Leaves	Itching, acne, dermatitis, eczema	Crush to extract juice	Apply directly on the affected part or mix with black soap for bathing
46	*Aframomum melegueta*	Leaves	Chickenpox, smallpox, ringworm	Decoction, crushing	Drinking can be used for bathing, can be applied on the affected part
47	*Vitellaria paradoxa*	Seeds	Rashes	Extract oil from the seed	Use as cream on the affected part or all over the body
48	*Spigelia anthelmia*	Roots	Measles	Decoction	for bathing or topical application on the affected part
49	*Picralima nitida*	Leaves, seeds, roots, fruit pulp	Measles, ringworm,	Mill seeds to powder, decoct roots, or marsh fruit pulp to paste	Apply topically on the affected part. Mix with shea butter as cream on the part
50	*Syzygium aromaticum*	Seeds	Acne, scars, dehydration, scars	Decoction	Mix with black soap or apply the liquid to the affected part
51	*Cymbopogon citatus*	Leaves	Itching, acne, dermatitis, eczema	Crush to extract juice	Apply topically on the affected part. Mix with black soap for bathing
52	*Olax subscorpioidea*	Root	general skin conditions including measles	Decoction	Bathing and drinking
53	*Erythrophleum suaveolens*	Stem bark	eczema wound healing	Decoction	Apply topically on the affected part. Mix with shea butter as cream on the part
54	*Carica papaya*	Leaves	all kinds of skin issues	Crush to extract juice	Juice can be mixed with black soap for bathing, or applied to the affected part
55	*Curcuma longa*	Leaves	Poliomyelitis, measles, ringworm	Decoction	Apply topically on the affected part. Mix with black soap for bathing
56	*Azadirachta indica*	Leaves	all kinds of skin issues	Crush to extract juice	Apply topically on the affected part. Mix with black soap for bathing
57	*Calotropis procera*	Leaves	general skin conditions including measles	Crush to extract juice	Apply topically on the affected part. Mix with black soap for bathing

Table 7. Ethnomedicinal reports on uses of the plants

S/N	Botanical name	Constituent	Ethnomedicinal uses
1	*Vernonia amygdalina*	Vernodalin, alkaloids, anthraquinones, edotides, sesquiterpene lactones, and steroid glycosides [18,19]	Management of measles [20], wound healing [21], and antimicrobial potentials [22]
2	*Bryophyllum pinnatum*	Kaempferol and quercetin [23,24]	Antimicrobial and wound healing potentials [25,26].
3	*Euphorbia heterophylla*	Eucalyptol and camphor [27]	Anti-inflammatory and wound healing effects [28]
4	*Xylopia aethiopica*	Kaurene, 9,12-octadecadienoic acid, and 2-amino-3-hydroxy phenol [29]	Antifungal activities [30].
5	*Tetrapleura tetraptera*	Sapogenin and aridanin [31]	Anti-ulcerative, antibacterial, and antioxidant potential could be attributed to a wound healing potential [32,33,34]
6	*Cassia alata*	Quercetin, kaempferol and palmitic acid ceryl ester [35]	Antifungal and wound healing potentials [36,37].
7	*Gnetum africanum*	Hydrocyanic acid, tannin, oxalate, and phytic acid [38]	Antimicrobial potentials against some fungal and bacterial strains [39].
8	*Terminalia glaucescens*	Arjunic acid, arjungenin, sericoside, and friedelin [40]	In vitro antimicrobial potentials against some fungal pathogens [41].
9	*Anogeissus leiocarpus*	Tannins, flavonoids, terpenes, and saponins [42,43]	Wound, jaundice, and other microbial infections [44]
10	*Solanum macrocapon*	Phytosterols and triterpenes [45]	Treats skin disease, infections, and sores associated with bacteria [46].
11	*Olax subscorpioides*	Saponins, tannins, steroids, cardiac glycosides, flavonoids, alkaloids, terpenoids, phenols, and carbohydrates [47,48]	Effective in the treatment of surgical wound isolates [49].
12	*Persea americana*	Flavonoids, glycosides, and lignans [50]	Treatment of fungi-related skin disorders [51].
13	*Ageratum conyzoides*	Precocene I and sesquiterpene [52]	Treatment of infections, skin diseases, and wound-healing [53].
14	*Xylopia villosa*	Abinene or (Z)-β-ocimene [54]	The effectiveness of Xylopia spp. in the treatment of boils and wounds attributed to bacteria and fungi [55]
15	*Xylopia aethiopica*	Flavonoids, tannins, total phenolics, cardiac glycoside, alkaloids, and steroids [56]	Antibacterial and antifungal potentials [57,58].
16	*Acacia nilotica*	Saponins, tannins, flavonoids, alkaloids, oxalates, and cyanogenic glycosides [59]	Packed with sebum reduction properties, thus act as an anti-acne and skin protection agent [60]; suitable for treating smallpox and ulcers [61,62].
17	*Citrus aurantifolia*	Geraniol, E-citral, Z-citral, β-ocimene, Limonene, linalool, citronellal, and citronellol [63,64]	Antibacterial effect against skin bacterial, antiaging; antiallergenic [65, 66] properties.

18	*Rauvolfia vomitoria*	Alkaloids reserpine, rauwolfine, rescinnamine, serpentine, ajmaline, serpentinine, steroid-serposterol, and saponin [67]	Treatment of parasitic skin diseases and other skin infections [68,69].
19	*Merremia dissecta*	Glycosides, alkaloids, tannins, saponins, phenols, and flavonoids [70]	Treatment of inflammations, itching, snake bites, etc. [71].
20	*Citrullus colocynthis*	Cucurbitacin, flavonoids, alkaloids, and phenolic acids [72]	Antifungal and antibacterial potentials [73].
21	*Annona senegalensis*	P-cymene, a-phellandrene, a-pinene, Z-sabinol and limonene [74]	Prevents skin inflammation, and possesses antimicrobial and antifungal properties [75,76].
22	*Bambusa vulgaris*	Nucleosides, amino acids, β-carboline, and megastigmane glycosides [77]	Wound-healing [78].
23	*Zingiber officinale*	Phenolic compounds, terpenes, polysaccharides, lipids, organic acids, and raw fibers [79]	Antibacterial potentials [80].
24	*Phyllantus amarus*	Flavonoid, triterpenoid bufalin and tetratetracontane [81]	Treats ulcers, sores, swelling and itchiness, wounds, scabies, ringworm, and crusty lesions [82].
25	*Ficus exasperata*	Monoterpenes, sesquiterpenes, a diterpenoid, aliphatic compounds, and sulfur [83]	Wounds healing, anti-ulcer, and anti-inflammatory activities [84].
26	*Elaeis guineensis Jacq*	High saponin, phenol, and tannin [85]	Anti-inflammatory potentials [86].
27	*Euphorbia unispina*	Triterpene [87]	Treatment of sunburn [88].
28	*Mitracarpus villosus*	Stigmasterol, quercetin, and psychorubrin [89]	Antibacterial, antioxidant, antifungal, anticancer activities [90,91].
29	*Momordica charantia*	Triterpenoids, saponins, polypeptides, flavonoids, alkaloids, and sterols [92,93,94]	Treats of wounds and other skin conditions [95].
30	*Nauclea latifolia*	Strictosamide, naucleamides A, naucleamide F, quinovic acid-3-O-beta-rhamnosylpyranoside, and quinovic acid 3-O-beta-fucosylpyranoside [96]	Antimicrobial potentials [97].
31	*Laganaria breviflorus*	Phenols, alkaloids, carotenoids, and flavonoids [98]	Antimicrobial potentials [99,100].
32	*Psorospermum febrifugum*	Saponosides, reducing sugars, polyphenols, flavonoids, tannins, proteins, anthocyanins, and alkaloids [101]	Antioxidant and sun protection potentials [102].
33	*Khaya grandifoliola*	Saponins, tannins, alkaloids, anthraquinones, flavonoids, reducing sugars, and phlobatanins [103]	Treatment of various skin conditions and wound healing potentials [104].

34	*Plumbago zeylanica*	Naphthaquinones, alkaloids, glycosides, steroids, triterpenoids, tannins, phenolic compounds, flavonoids, saponins, coumarins, carbohydrates, fixed oil and fats, and proteins [105]	Good remedy for skin diseases pimples, eruptions, and wounds [106].
35	*Euphorbia laterifolia*	Saponins, tannins, flavonoids, coumarin, steroid, glycosides, triterpenes, terpenoids, alkaloids, and caffeic acid [107,108]	Has antimicrobial potentials [109].
36	*Piliostigma thonningii*	Flavonoids, tannins, kaurane diterpenes, alkaloids, carbohydrates, saponins, terpenes, and volatile oils [110]	Tackles wound infection and other skin diseases [111].
37	*Parquetina nigrescens*	Alkaloids, saponins, flavonoids, cardiac glycosides, steroids, tannins, phlobatannins, cardenolides, phenolics, anthraquinones and triterpenes with alkaloids [112]	Antioxidant activities [113].
38	*Bridelia atroviridis*	Lycophene, β-carotene, total phenol and flavonoids [114]	Antimicrobial and antioxidant properties [114].
39	*Ricinus communis*	Alkaloids, terpenoids, flavonoids, benzoic acid derivatives, coumarins, tocopherols, terpenoids, and fatty acids [115]	Antimicrobial potentials [116,117,118, 119].
40	*Allium sativa*	Sulfur-containing constituents such as alliin, allicin, ajoenes, vinyldithiins, and flavonoids such as quercetin [120].	Combats phototoxic and photoallergic reactions, treat dermatitis and cures premature aging [121,122,123,124].
41	*Caesalpinia bonduc*	Caesalpinianone, 6-O-methylcaesalpinianone, hematoxylol, stereochenol A, 6′-O-acetylloganic acid, 4′-O-acetylloganic acid, and 2-O-β-d-glucosyloxy-4-methoxybenzenepropanoic acid [125]	Antimicrobial activity and anti-oxidant properties [126,127].
42	*Ocimum gratissimum*	Phenylpropene, sesquiterpenes, and monoterpenes [128].	Possess antifungal activities against dermatophytes [129].
43	*Mentha piperita*	Menthol and menthone [130]	Antimicrobial activity and great healing properties against numerous skin diseases such as eczema [131,132].
44	*Ipomoea asarifolia*	Rutin, chlorogenic acid, and caffeic acid [133]	Treats skin infections, abdominal cramps, and diarrhea [134].
45	*Moringa oleifera*	Vitamins, phenolic acids, flavonoids, isothiocyanates, tannins, and saponins [135]	Wound healing properties [136].
46	*Aframomum melegueta*	Sabinene, α-pinene and β-caryophyllene [137]	Antimicrobial activities [138].
47	*Vitellaria paradoxa*	Gallic acid, catechin, epicatechin, epicatechin gallate, gallocatechin, epigallocatechin, gallocatechin gallate, and epigallocatechin gallate-as well as quercetin and trans-cinnamic acid [139]	Antimicrobial properties [139]

48	*Spigelia anthelmia*	Alkaloids, flavonoids, saponin, tannin, phenolics, cardiac glycosides, phlobatannin, and terpenoids [140]	Possess antimicrobial properties [141,142].
49	*Picralima nitida*	Alkaloids, tannins, polyphenols, and steroids [143]	Has antimicrobial potentials [143].
50	*Syzygium aromaticum*	Limonin, ferulic aldehyde, eugenol, and eugenol acetate [144]	Possess anti-wrinkling and antioxidant activities [145,146].
51	*Cymbopogon citatus*	Geranial, neral and myrcene [147]	Antimicrobial and anti-inflammatory potential [148].
52	*Olax subscorpioidea*	Calcium, copper, manganese, magnesium, sodium, zinc, potassium, aluminum, silicon, phosphorus, sulfur, chlorine, iron, cobalt, nickel, bromine, rubidium, and strontium [149]	Possess anti-inflammatory potentials [14].
53	*Erythrophleum suaveolens*	α-citral, β-citral, squalene, phenols, steroids, tannins, flavonoids, alkaloids, saponin, and cardiac glycosides [150].	Wound healing and antioxidant properties [151].
54	*Carica papaya*	Carbohydrates, proteins, alkaloids (carpaine and pseudocarpaine), proteolytic enzymes (papain and quimiopapain), and benzyl isothiocyanate [152]	Antimicrobial and wound healing properties [153].
55	*Curcuma longa*	Curcumin, demethoxycurcumin and bisdemethoxycurcumin [154]	Wound healing, treats inflammation, contact dermatitis, and contact urticaria [155,156].
56	*Azadirachta indica*	Azadirachtin, nimbolinin, nimbin, nimbidin, nimbidol, salannin, and quercetin [157,158]	Wound healing potential [159].
57	*Calotropis procera*	Phenols, steroids, alkaloids, and cardenolides [160]	Dermatitis, ringworm, and other skin diseases [161]

Conclusion

This study has helped to preserve folkloric knowledge and digitalize information on some medicinal plants that are commonly used in the management of various skin conditions among the people of Ilorin, Nigeria. Some pieces of scientific literature on ethnomedicinal uses of the plants mentioned in this study have been reported. However, further findings are necessary to substantiate these claims and investigate the safety of the plant extracts to all layers of the skin.

Funding

No external funding was received for this research.

Conflict of Interests

The authors declare no conflict of interest.

Acknowledgements

The authors appreciate the contribution of Mr. Bolu Ajayi toward identifying medicinal plants.

References

[1] Olapade O. The use of herbs in alternative health care delivery in Nigeria. Paper delivered at the symposium organized by the National Association of botany Students, Obafemi Awolowo University, Ile-Ife 2000.

[2] Yadav M, Khan KK, Beg M. Ethnobotanical plants used for curing skin diseases by tribals of Rewa district (Madhya Pradesh). Indian J Life Sci 2012;2:123-127.

[3] Hay RJ, Johns NE, Williams HC, Bolliger IW, Dellavalle RP,

et al. The global burden of skin disease in 2010: an analysis of the prevalence and impact of skin conditions. J Investig Dermatol 2014;134:1527-1534.

[4] Labreche MJ, Lee GC, Attridge RT, Mortensen EM, Koeller J, et al. Treatment failure and costs in patients with methicillin-resistant Staphylococcus aureus (MRSA) skin and soft tissue infections: a South Texas Ambulatory Research Network (STARNet) study. J Am Board Fam Med 2013;26:508-517.

[5] Stevens DL, Bisno AL, Chambers HF, Dellinger EP, Goldstein EJ, et al. Practice guidelines for the diagnosis and management of skin and soft tissue infections: 2014 update by the infectious diseases society of America. Clin Infect Dis 2014;59:e10-52.

[6] Reszke R, Pełka D, Walasek A, Machaj Z, Reich A. Skin disorders in elderly subjects. Int J Dermatol 2015;54:e332-e338.

[7] Dalgard FJ, Svensson Å, Gieler U, Tomas-Aragones L, Lien L, et al. Dermatologists across Europe underestimate depression and anxiety: results from 3635 dermatological consultations. Br J Dermatol 2018;179:464-470.

[8] Mathers CD, Lopez AD, Murray CJ. The burden of disease and mortality by condition: data, methods, and results for 2001. Global burden of disease and risk factors 2006;1;45-88.

[9] Amin TT, Ali A, Kaliyadan F. Skin disorders among male primary school children in Al Hassa, Saudi Arabia: prevalence and socio-demographic correlates-a comparison of urban and rural populations. Rural Remote Health 2011;11:1517.

[10] Hu J, McKoy K, Papier A, Klaus S, Ryan T, et al. Dermatology and HIV/AIDS in Africa. J Glob Infect Dis 2011;3:275-280.

[11] Andersen K, Davis MD, Mark DP. The epidemiology of skin and skin-related diseases: a review of population-based studies performed by using the Rochester epidemiology project. Mayo Clin Proc 2013;88:1462-1467.

[12] Misery L, Rahhali N, Duhamel A, Taieb C. Epidemiology of pruritus in France. Acta Derm Venereol 2012;92:541-542.

[13] Nigerian Association of Dermatologists. (2017) History of the Nigerian Association of Dermatologists [Online] [Accessed November 23, 2017] https://www.nad.org.ng/history-of-thenigerian-association-of-dermatologists

[14] Adeoluwa OA, Aderibigbe AO, Bakre AG. Evaluation of the antidepressant-like effect of Olax subscorpioidea Oliv. (Olacaceae) extract in mice. Drug Res 2015;65:306-311.

[15] Fleischer TC, Mensah ML, Mensah AY, Komlaga G, Gbedema SY, et al. Antimicrobial activity of essential oils of Xylopia aethiopica. Afr J Tradit Complement Altern Med 2008;5: 391-393.

[16] Ngoua-Meye-Misso RL, Sima-Obiang C, Ndong JD, Ndong-Atome GR, Ondo JP, et al. Medicinal plants used in the management of cancer and other related diseases in Woleu-Ntem province, Gabon. Eur J Integr Med 2019;29:100924.

[17] Mesfin F, Demissew S, Teklehaymanot T. An ethnobotanical study of medicinal plants in Wonago Woreda, SNNPR, Ethiopia. J Ethnobiol Ethnomedicine 2009;5:1-8.

[18] Kupchan SM, Hemmnigway RJ, Karim A, Werner D. Tumor inhibitors. XLVII Vernodalin and Vernomygdin. Two new cytotoxic sesquiterpene lactones from Vernonia amygdalina del. J Org Chem 1969;34:3908-3911.

[19] Ojimelukwe PC, Amaechi N. Composition of Vernonia amygdalina and its Potential Health Benefits. Int J Agric Environ Biot 2019;4:1836-1848.

[20] Joe B, Vijaykumar M, Lokesh BR. Biological properties of curcumin-cellular and molecular mechanisms of action. Crit Rev Food Sci Nutr 2004;44:97-111.

[21] Sonibare MA, Moody JO, Adesanya EO. Use of medicinal plants for the treatment of measles in Nigeria. J Ethnopharmacol 2009;122:268-272.

[22] Nafiu AB, Akinwale OC, Akinfe OA, Owoyele BV, Abioye AI, et al. Histomorphological evaluation of wound healing-comparison between use of honey and vernonia amygdalina leaf juice. Nigeria Trop J Health Sci 2016;23:10-11.

[23] El Abdellaoui S, Destandau E, Toribio A, Elfakir C, Lafosse M, et al. Bioactive molecules in Kalanchoe pinnata leaves: extraction, purification, and identification. Anal Bioanal Chem 2010; 398:1329-1338.

[24] Aoki C, Hartati SR, Santi MR, Firdaus R, Hanafi M, et al. Isolation and identification of substances with anti-hepatitis C virus activities from Kalanchoe pinnata. Int J Pharm Pharm Sci 2014;1;6:211-215.

[25] Nurudeen QO, Falana MB. Identification and quantification of secondary metabolites and the antimicrobial efficacy of leaves extracts of some medicinal plants. Zanco J Pure Appl Sci 2021; 33:91-106.

[26] Okwu DE, Nnamdi FU. Two novel flavonoids from Bryophyllum pinnatum and their antimicrobial activity. J Chem Pharm Res 2011;3:1-10.

[27] Elshamy AI, Abd-ElGawad AM, El Gendy AE, Assaeed AM. Chemical characterization of Euphorbia heterophylla L. essential oils and their antioxidant activity and allelopathic potential on Cenchrus echinatus. L. Chem Biodivers 2019;16:e1900051.

[28] Sharma N, Samarakoon KW, Gyawali R, Park YH, Lee SJ, et al. Evaluation of the antioxidant, anti-inflammatory, and anticancer activities of Euphorbia hirta ethanolic extract. Molecules 2014; 19:14567-14581.

[29] Okagu IU. Bioactive constituents of methanol extract of Xylopia aethiopica (UDA) fruits from Nsukka, Enugu State, Nigeria. Open Access Libr 2018;5:1.

[30] Tamfu AN, Ceylan O, Kucukaydin S, Ozturk M, Duru ME, et al. Antibiofilm and enzyme inhibitory potentials of two annonaceous food spices, african pepper (Xylopia aethiopica) and african nutmeg (Monodora myristica). Foods 2020;9:1768.

[31] Aladesanmi AJ. Tetrapleura tetraptera: Molluscicidal activity and chemical constituents. Afr J Tradit Complement Altern Med 2007;4:23-36.

[32] Khan M, Patil PA, Shobha JC. Influence of Bryophyllum pinnatum (Lim.) leaf extract on wound healing in albino rats. J Nat Remedies 2004;4:41-46.

[33] Gberikon GM, Adeoti II, Etim EE. Antibacterial activity of Tetrapleura tetraptera fruit and stem bark extracts against Pseudomonas aeruginosa. Int Sci Res J 2015;1:1-4.

[34] Okoronkwo NE, Echeme JO. Cholinesterase and microbial inhibitory activities of Tetrapleura tetraptera. J Nat Appl Sci 2012;4:156-163.

[35] Liu A, Xu L, Zou Z, Yang S. Studies on chemical constituents from leaves of Cassia alata. China. Zhongguo Zhong Yao Za

Zhi 2009;34:861-863.
[36] Timothy SY, Wazis CH, Adati RG, Maspalma ID. Antifungal activity of aqueous and ethanolic leaf extracts of Cassia alata Linn. J Appl Pharm Sci 2012;2:182-185.
[37] Sule WF, Okonko IO, Omo-Ogun S, Nwanze JC, Ojezele MO, et al. Phytochemical properties and in-vitro antifungal activity of Senna alata Linn. crude stem bark extract. J Med Plant Res 2011;5:176-183.
[38] Ekop AS. Determination of the chemical composition of Gnetum africanum (AFANG) seeds. Pak J Nut 2007;6:40-43.
[39] Eneh FU, Onwubiko CE, Ugochukwu GC. Phytochemical and antimicrobial activity screening of Gnetum africanum leaf extracts. Int J Herb Med 2017;5:105-109.
[40] Rahman AU, Zareen S, Choudhary MI, Akhtar MN, Ngounou FN. Some chemical constituents of Terminalia glaucescens and their enzymes inhibition activity. Z Naturforsch B 2005; 60:347-530.
[41] Vandita P, Amin N, Khyati P, Monisha K. Effect of phytochemical constituents of Ricinus communis, Pterocarpus santalinus, Terminalia belerica on antibacterial, antifungal and cytotoxic activity. Int J Toxicol Pharmacol Res 2013;5:47-54.
[42] Elegami AA. Antimicrobial activity of some species of the family Combretaceae. Phytother Res 2002;16:555-561.
[43] Salau AK, Yakubu MT, Oladiji AT. Cytotoxic activity of aqueous extracts of Anogeissus leiocarpus and Terminalia avicennioides root barks against Ehrlich Ascites Carcinoma cells. Indian J Pharmacol 2013;45:381-385.
[44] Salih EY, Kanninen M, Sipi M, Luukkanen O, Hiltunen R, et al. Tannins, flavonoids and stilbenes in extracts of African savanna woodland trees Terminalia brownii, Terminalia laxiflora and Anogeissus leiocarpus showing promising antibacterial potential. S Afr J Bot 2017;108:370-386.
[45] Haliński ŁP, Paszkiewicz M, Gołębiowski M, Stepnowski P. The chemical composition of cuticular waxes from leaves of the gboma eggplant (Solanum macrocarpon L.). J Food Compos Anal 2012;25:74-78.
[46] Ajibade VA, Ibiyemi MF. The antibacterial potency of alkaloid and saponin extracts from Solanum macrocapon (Garden Egg). J Adv Microbiol 2017;59:1-5.
[47] Odoma S, Zezi AU, Danjuma NM, Ahmed A. Analgesic and anti-inflammatory activities guided fractionation of Olax suscorpioidea leaf extract in mice and rats. Niger J Pharm Sci 2015; 14:30-43.
[48] Adegbite OS, Akinsanya YI, Kukoyi AJ, Iyanda-Joel WO, Daniel OO, et al. Induction of rat hepatic mitochondrial membrane permeability transition pore opening by leaf extract of Olax subscorpioidea. Pharmacogn Res 2015;7:S63- S68.
[49] Osuntokun OT, Omolola AY. Efficacy of nigerian medicinal plant (Olax subscorpioidea. Oliv.) root extract against surgical wound isolates. Am J Biochem Biotechnol 2019;2:1-11.
[50] Park S, Nam YH, Rodriguez I, Park JH, Kwak HJ, et al. Chemical constituents of leaves of Persea americana (avocado) and their protective effects against neomycin-induced hair cell damage. Rev bras farmacogn 2020;29:739-743.
[51] Ahmad MH, Jatau AI, Alshargi OY, Mohammed M, Muhammad S, et al. Ethnopharmacological uses, phytochemistry, pharmacology, and toxicology of Olax subscorpioidea Oliv (Olacaceae): a review. Future J Pharm Sci 2021;7:1-3.
[52] Kouame BK, Toure D, Kablan L, Bedi G, Tea I, et al. Chemical constituents and antibacterial activity of essential oils from flowers and stems of Ageratum conyzoides from Ivory Coast. Rec Nat Prod 2018;12:160-168
[53] Makopa M, Mangiza B, Banda B, Mozirandi W, Mombeshora M, et al. Antibacterial, antifungal, and antidiabetic effects of leaf extracts from Persea americana Mill. (Lauraceae). Biochem Res Int 2020;2020:1-10.
[54] Yapi TA, Boti JB, Ahibo CA, Bighelli A, Casanova J, et al. Composition of leaf and stem bark oils of Xylopia villosa Chipp. J Essent Oil Res 2012;24:253-257.
[55] Ogbonna CN, Nozaki K, Yajima H. Antimicrobial activity of Xylopia aethiopica, Aframomum melegueta and Piper guineense ethanolic extracts and the potential of using Xylopia aethiopica to preserve fresh orange juice. Afr J Biotechnol 2013;12:1993-1998.
[56] Fategbe MA, Avwioroko OJ, Ibukun EO. Comparative biochemical evaluation of the proximate, mineral, and phytochemical constituents of Xylopia aethiopica whole fruit, seed, and pericarp. Prev Nutr Food Sci 2021;26:219-229.
[57] Fleischer TC, Mensah ML, Mensah AY, Komlaga G, Gbedema SY, et al. Antimicrobial activity of essential oils of Xylopia aethiopica. Afr J Tradit Complement Altern Med 2008;5:391-393.
[58] Narendhirakannan RT, Nirmala JG, Caroline A, Lincy S, Saj M, et al. Evaluation of antibacterial, antioxidant and wound healing properties of seven traditional medicinal plants from India in experimental animals. Asian Pac J Trop Biomed 2012;2:S1245-S1253.
[59] Ndamitso MM, Mustapha S, Etsuyankpa MB, Ajai AI, Mathew JT. Evaluation of chemical composition of Acacia nilotica seeds. FUW Trends Sci Technol J 2017;2:927-931
[60] Hwang YS, Chang BY, Kim DS, Cho HK, Kim SY. Effects of the Syzygium aromaticum L. extract on antioxidation and inhibition of matrix metalloproteinase in human dermal fibroblast. Asian Pac J Trop Biomed 2019;9:53-59.
[61] Ali A, Akhtar N, Khan BA, Khan MS, Rasul A, et al. Acacia nilotica: a plant of multipurpose medicinal uses. J Med Plant Res 2012;6:1492-1496.
[62] Sharma AK, Kumar A, Yadav SK, Rahal A. Studies on antimicrobial and immunomodulatory effects of hot aqueous extract of Acacia nilotica L. leaves against common veterinary pathogens. Vet Med Int 2014;2014:1-9
[63] Al-Aamri MS, Al-Abousi NM, Al-Jabri SS, Alam T, Khan SA. Chemical composition and in-vitro antioxidant and antimicrobial activity of the essential oil of Citrus aurantifolia L. leaves grown in Eastern Oman. J Taibah Univ Med Sci 2018;13: 108-112.
[64] Lemes RS, Alves CC, Estevam EB, Santiago MB, Martins CH, et al. Chemical composition and antibacterial activity of essential oils from Citrus aurantifolia leaves and fruit peel against oral pathogenic bacteria. An Acad Bras Cienc 2018;90:1285-1292.
[65] Fonseca MA, Karpe AN, Keerthi P, Mendes RM. Fruit peel

soap and its antibacterial properties in skincare. Int J Curr Pharm Res 2019;11:17-20.

[66] Balasundram N, Sundram K, Samman S. Phenolic compounds in plants and agri-industrial by-products: Antioxidant activity, occurrence, and potential uses. Food Chem 2006;99:191-203.

[67] Gill LS. Ethnomedical Uses of Plants in Nigeria. Benin: Uniben Press, University of Benin. 1992.

[68] Tekwu EM, Bosompem KM, Anyan WK, Appiah-Opong R, Owusu KB, et al. In vitro assessment of anthelmintic activities of Rauwolfia vomitoria (Apocynaceae) stem bark and roots against parasitic stages of Schistosoma mansoni and cytotoxic study. J Parasitol Res 2017;11-12: 1-11.

[69] Emencheta SC, Enweani BI, Oli AN, Ibezim EC, Imanyikwa IE. Antimicrobial evaluation of plant parts of Rauwolfia vomitoria. J Complement Med Res 2020;11-20.

[70] Wadgama AA, Mandade RJ, Jangid PR. Therapeutic review on medicinal plant Merremia dissecta. Int J Recent Sci Res 2020;11:37466-37470.

[71] Austin DF. Merremia dissecta, (Convolvulaceae): Condiment, medicine, ornamental and weed: a review. Econ Bot 2007;61:109-120.

[72] Meybodi MS. A review on pharmacological activities of Citrullus colocynthis (L.) Schrad. Asian J Res Rep Endocrinol 2020;3:25-34.

[73] Mohammed AA. In-vitro antibacterial, antifungal, antibiofilm, and antioxidant potentials of isopimpinellin recovered from Citrullus colocynthis. Int J Pharm Pharm Sci 2016;8:117-122.

[74] Khallouki F, Younos C, Soulimani R, Bessière JM. Chemical composition of the essential oils of Annona cuneata L. and Annona senegalensis Pers. stem barks. Flavour Fragr J 2002;17; 398-400.

[75] Younoussa L, Nukenine EN, Danga SP, Esimone CO. Repellent activity of the creams formulated from Annona senegalensis and Boswellia dalzielii leaf fractions and essential oils against Anopheles gambiae (Diptera: Culicidae). Asian Pac J Trop Dis 2016;6:973-978.

[76] Anthony O, Said O, Hamis I, Ame M, Odalo O. Assessment of antifungal activity of Annona senegalensis plant parts of malassezia globosa. Nat Prod Res 2017;5:1-5

[77] Sun J, Ding ZQ, Gao Q, Xun H, Tang F, et al. Major chemical constituents of bamboo shoots (Phyllostachys pubescens): qualitative and quantitative research. J Agric Food Chem 2016; 64:2498-2505.

[78] Ghanbarinasab Z, Hosseini-Bensenjan M, Ziabari EZ, Aminnia S, Borazjani R, et al. Topical Bambusa vulgaris extract enhances wound healing in cutaneous leishmaniasis. J Pathog 2021; 7860474.

[79] Mao QQ, Xu XY, Cao SY, Gan RY, Corke H, et al. Bioactive compounds and bioactivities of ginger (Zingiber officinale Roscoe). Foods 2019;8:185.

[80] Suliman RS, Wai L, Hanif NM, Yusuf E, Asmani F. Comparative studies of Zingiber officinale leaves and rhizomes on the antibacterial effect. Int J Pharm Anal Res 2014;3:262-268.

[81] Zubair MF, Atolani O, Ibrahim SO, Adebisi OO, Hamid AA, et al. Chemical constituents and antimicrobial properties of Phyllanthus amarus (Schum & Thonn). Bayero J Pure Appl Sci 2017;10:238-246.

[82] Adegoke AA, Iberi PA, Akinpelu DA, Aiyegoro OA, Mboto CI. Studies on phytochemical screening and antimicrobial potentials of Phyllanthus amarus against multiple antibiotic-resistant bacteria. Int J Appl Res Nat Prod 2010;3:6-12.

[83] Sonibare MA, Ogunwande IA, Walker TM, Setzer WN, Soladoye MO, et al. Volatile constituents of Ficus exasperata leaves. Nat Prod Commun 2006;1:763-765.

[84] Obuekwe IS, Okoyomo EP, Anka US. Effect of plant extract combinations on some bacterial pathogens. J Appl SCI Environ Manag 2020;24:627-632.

[85] Kimtun P, Yunu T, Paichid N, Klomklao S, Prasertsan P, et al. Study of chemical constituents from palm fruit (Elaeis guineensis) after harvesting and the application of palm lipase for biodiesel production. ASEAN J Sci Technol 2017;20:1-9.

[86] Anyanji VU, Mohamed S, Zokti JA, Ado MA. Anti-inflammatory properties of oil palm leaf (Elaeis guineensis Jacq.) extract in aged rats. Int J Pharm Pharm Sci 2013;5:134-136.

[87] Burkill HM. Brief descriptions and details of the buses of over 4,000 plants. The useful plants of West Tropical Africa. Royal botanical gardens 2004;4:969.

[88] Kirbag S, Erecevit P, Zengin F, Guvenc AN. Antimicrobial activities of some Euphorbia species. Afr J Tradit Complement Altern Med 2013;10:305-309.

[89] Elusiyan CA, Ayoade O, Adeloye AO, Olorunmola FO, Agbedahunsi JM, et al. Antisickling and radical scavenging activities of selected medicinal plants and compounds from Mitracarpus villosus (Sw.) DC. Cham Eur J Med Plant 2018;24:1-10.

[90] Ekalu A. Medicinal uses, phytochemistry, and pharmacological activities of mitracarpus species (rubiaceae): a review. Sci Afr 2021;11:e00692.

[91] Fabri RL, Grazul RM, Carvalho LO, Coimbra ES, Cardoso GM, et al. Antitumor, antibiotic and antileishmanial properties of the Pyranonaphthoquinone Psychorubrin from Mitracarpus frigidus. Anais da Academia Brasileira de Ciências 2012;84:1081-1090.

[92] Zhao GT, Liu JQ, Deng YY, Li HZ, Chen JC, et al. Cucurbitane-type triterpenoids from the stems and leaves of Momordica charantia. Fitoterapia 2014;95:75-82.

[93] Ma L, Yu AH, Sun LL, Gao W, Zhang MM, et al. Two new bidesmoside triterpenoid saponins from the seeds of Momordica charantia L. Molecules 2014;19:2238-2246.

[94] Ahmad Z, Zamhuri KF, Yaacob A, Siong CH, Selvarajah M, et al. In vitro anti-diabetic activities and chemical analysis of polypeptide-k and oil isolated from seeds of Momordica charantia (bitter gourd). Molecules 2012;17:9631-9640.

[95] Agyare C, Adarkwa-Yiadom M, Osei-Asante S. Medicinal plants used for treatment of wounds and skin infections: assessment of wound healing and antimicrobial properties of Mallotus oppositifolius and Momordica charantia. Int J Herb Med 2014;6:50-58.

[96] Ata A, Udenigwe CC, Matochko W, Holloway P, Eze MO, et al. Chemical constituents of Nauclea latifolia and their anti-GST and anti-fungal activities. Nat Prod Commun 2009;4:1185-1188.

[97] Okiei WO, Ogunlesi M, Osibote EA, Binutu MK, Ademoye

MA. Comparative studies of the antimicrobial activity of components of different polarities from the leaves of Nauclea latifolia. Res J Med Plant 2011;5:321-329.

[98] Adeyemi MA, Ekunseitan DA, Abiola SS, Dipeolu MA, Egbeyale LT, et al. Phytochemical analysis and GC-MS determination of Lagenaria breviflora R. fruit. Int J Pharmacogn Phytochem Res 2017;9:1045-1050.

[99] Olorunnisola OS, Afolayan AJ, Adetutu A. Sub-chronic administration of methanolic whole fruit extract of Lagenaria breviflora (Benth.) Roberty induces mild toxicity in rats. Pharmacogn Mag 2015;11:S516-S521.

[100] Balogun ME, Ajayi AF, Oji OJ, Besong EE, Finbarrs-Bello E, et al. Toxicological and biochemical studies of ethanolic fruit extract of Adenopus breviflorus (Lagenaria breviflora Roberty) in male albino Wistar rats. Am J Phyt Clin Ther 2014;2:1112-1123.

[101] Félicienne A, Isabelle ST, Pascal TA, Espérance M, Rose KE, et al. The aqueous extract of the root bark of Psorospermum febrifugum Spach effectively corrects anaemia. experimental study on Wistar rats. J Appl Biosci 2019;27:14137-14146.

[102] Namukobe J, Sekandi P, Byamukama R, Murungi M, Nambooze J, et al. Antibacterial, antioxidant, and sun protection potential of selected ethno medicinal plants used for skin infections in Uganda. Trop Med Health 2021;49:1-0.

[103] Ojokuku SA, Okunowo WO, Apena A. Evaluation of the chemical composition of Khaya grandifoliola and Ficus capensis. J Med Plant Res 2010;4:1126-1129.

[104] Quartey AK, Orman E, Mireku-Gyimah NA, Goku PE, Alidu F, et al. Evaluating the antibacterial, antioxidant and wound healing properties of the stem bark extract of Khaya grandifoliola (Welw) CDC (Meliaceae) (African mahogany). J Med Plant Res 2020;14:604-612.

[105] Kodati DR, Burra S, Kumar GP. Evaluation of wound healing activity of methanolic root extract of Plumbago zeylanica L. in Wistar albino rats. Asian J Plant Sci 2011;1:26-34.

[106] Tebeka T. Studies on antioxidant and antimicrobial activities of Plumbago zeylanica Linn. traditionally used for the treatments of intestinal warms and skin diseases in Ethiopia. Res J Med Plant 2015;9:252-263.

[107] Coker ME, Oaikhena AO, Ajayi TO. Antimicrobial activity of extracts and fractions of Euphorbia lateriflora (Schum. and Thonn) on microbial isolates of the urinary tract. Saudi J Biol Sci 2021;28:4723-4731.

[108] Falana MB, Nurudeen QO. phytochemical screening and in vitro antimicrobial activities of Euphorbia Lateriflora on selected pathogens. Iraqi J Sci 2022;63:1402-1412.

[109] Elufioye TO, Olaifa O. Pharmacognostic evaluation of the leaves and stem bark of Euphorbia lateriflora schum & thonn (Euphorbiaceae). Niger J Nat Prod Med 2014;18:18-23

[110] Ighodaro OM, Agunbiade SO, Omole JO, Kuti OA. Evaluation of the chemical, nutritional, antimicrobial and antioxidant-vitamin profiles of Piliostigma thonningii leaves. Res J Med Plant 2012;6:537-543.

[111] Ozolua RI, Alonge P, Igbe I. Effects of leaf extracts of Piliostigma thonningii schum on aortic ring contractility and bleeding time in rats. J Herbs Spices Med Plants 2010;15:326-333.

[112] Kayode OT, Yakubu MT. Parquetina nigrescens leaves: chemical profile and influence on the physical and biochemical indices of sexual activity of male Wistar rats. J Integr Med 2017; 15:64-76.

[113] Ayoola AO, Akinloye O, Oguntibeju OO, Oke JM, Odetola AA. Antioxidant activities of Parquetina nigrescens. Afr J Adv Biotechnol 2011;10:4920-4925.

[114] Sokefun OO, Eleyowo OO, Avungbeto MO. In vitro antioxidant and antibacterial activity of Bridelia atroviridis (Arasado). J Complement Med Res 2017;17:1-7.

[115] Ribeiro PR, de Castro RD, Fernandez LG. Chemical constituents of the oilseed crop Ricinus communis and their pharmacological activities. Ind Crops Prod 2016;91:358-376.

[116] Abew B, Sahile S, Moges F. In vitro antibacterial activity of leaf extracts of Zehneria scabra and Ricinus communis against Escherichia coli and methicillin resistance Staphylococcus aureus. Asian Pac J Trop Biomed 2014;4:816-820.

[117] Abd-Ulgadir KS, Suliman SI, Zakria IA, Hassan NE. Antimicrobial potential of methanolic extracts of Hibiscus sabdariffa and Ricinus communis. Adv Med Plant Res 2015;3:18-22.

[118] Jeyaseelan EC, Jashothan PJ. In vitro control of Staphylococcus aureus (NCTC 6571) and Escherichia coli (ATCC 25922) by Ricinus communis L. Asian Pac. J Trop Biomed 2012;2:717-721.

[119] Naz R, Bano A. Antimicrobial potential of Ricinus communis leaf extracts in different solvents against pathogenic bacterial and fungal strains. Asian Pac J Trop Biomed 2012;2:944-947.

[120] El-Saber Batiha G, Magdy Beshbishy A, G Wasef L, Elewa YH, A Al-Sagan A, et al. Chemical constituents and pharmacological activities of garlic (Allium sativum L.): a review. Nutrients 2020;12:872.

[121] Capasso A. Antioxidant action and therapeutic efficacy of Allium sativum L. Molecules 2013;18:690-700.

[122] Majewski M. Allium sativum: facts and myths regarding human health. Rocz Panstw Zakl. Hig 2014;65:1-8.

[123] Goossens A. Contact-allergic reactions to cosmetics. J Allergy 2011;2011:467071.

[124] Mukherjee P, Maity N, Nema N, Sarkar B. Bioactive compounds from natural resources against skin aging. Phytomedicine 2011;19:64-73.

[125] Ata A, Gale EM, Samarasekera R. Bioactive chemical constituents of Caesalpinia bonduc (Fabaceae). Phytochem Lett 2009;2:106-109.

[126] Simin K, Khaliq-Uz-Zaman SM, Ahmad VU. Antimicrobial activity of seed extracts and bondenolide from Caesalpinia bonduc (L.) Roxb. Phytother Res 2001;15:437-440.

[127] Srinivasan RM, Chandrasekar MJ, Nanjan MJ, Suresh B. Antioxidant activity of Caesalpinia digyna root. J Ethnopharmacol 2007;113:284-291.

[128] Ashokkumar K, Vellaikumar S, Murugan M, Dhanya MK, Aiswarya S, et al. Chemical composition of Ocimum gratissimum essential oil from the South Western Ghats, India. Curr Opin Food Sci C 2020;1:27-30.

[129] Mbakwem-Aniebo C, Onianwa O, Okonko IO. Effects of Ocimum gratissimum leaves on common dermatophytes and

causative agent of Pityriasis versicolor in rivers state, Nigeria J Microbiol Res 2012;2:108-113.

[130] Schmidt E, Bail S, Buchbauer G, Stoilova I, Atanasova T, et al. Chemical composition, olfactory evaluation and antioxidant effects of essential oil from Mentha x piperita. Nat Prod Commun 2009;4:1107-1112

[131] Satmi FR, Hossain MA. In vitro antimicrobial potential of crude extracts and chemical compositions of essential oils of leaves of Mentha piperita L native to the Sultanate of Oman. Pac Sci Rev 2016;18:103-106.

[132] Pramila DM, Xavier R, Marimuthu K, Kathiresan S, Khoo ML, et al. Phytochemical analysis and antimicrobial potential of methanolic leaf extract of peppermint (Mentha piperita: Lamiaceae). J Med Plant Res 2012;6:331-533.

[133] Furtado AA, Torres-Rêgo M, Lima MC, Bitencourt MA, Estrela AB, et al. Aqueous extract from Ipomoea asarifolia (Convolvulaceae) leaves and its phenolic compounds have anti-inflammatory activity in murine models of edema, peritonitis and air-pouch inflammation. J Ethnopharmacol 2016;192:225-235.

[134] Meira M, Silva EP, David JM, David JP. Review of the genus Ipomea: traditional uses, chemistry and biological activities. Rev Bras 2012;22:682-713.

[135] Vergara-Jimenez M, Almatrafi MM, Fernandez ML. Bioactive components in Moringa oleifera leaves protect against chronic disease. Antioxidants 2017;6:91.

[136] Hukkeri VI, Nagathan CV, Karadi RV, Patil BS. Antipyretic and wound healing activities of Moringa oleifera Lam. in rats. Indian J Pharm Sci 2006;68:124-126.

[137] Lawal OA, Kasali AA, Opoku AR, Ojekale AB, Oladimeji OS, et al. Chemical composition and antibacterial activity of essential oil from the leaves of Aframomum melegueta (Roscoe) K. Schum from Nigeria. J Essent Oil-Bear Plants 2015;18:222-229.

[138] Osuntokun OT. Aframomum melegueta (grains of paradise). Ann Microbiol Infect Dis 2020; 3:1-6.

[139] Falana MB, Bankole MO, Afolabi RO. Differential antimicrobial effects of conventional and ethnobotanical extracts from Vitellaria paradoxa roots, barks and leaves. Br Microbiol Res J 2015;6:54-60.

[140] Awotedu OL, Ogunbamowo PO, Ariwoola OS, Chukwudebe EP. Phytochemical and phytomineral status of Spigelia anthelmia Linn leaves. Int J Bio Res Rev 2020;29:33-40

[141] Danlami U, Cecilia OE, Ifeanyi OM. Evaluation of the phytochemicals and antimicrobial activities of the ethanolic, hexane and ethyl acetate extracts of Spigelia anthelmia leaves. Int J Pharm Chem 2017;3:29.

[142] Edeoga HO, Okwu DE, Mbaebie BO. Phytochemical constituents of some Nigerian medicinal plants. Afr J Biotechnol 2005;4:685-688.

[143] Erharuyi O, Falodun A, Langer P. Medicinal uses, phytochemistry and pharmacology of Picralima nitida (Apocynaceae) in tropical diseases: a review. Asian Pac J Trop Med 2014;7:1-8.

[144] Nassar MI, Gaara AH, El-Ghorab AH, Farrag A, Shen H, et al. Chemical constituents of clove (Syzygium aromaticum, Fam. Myrtaceae) and their antioxidant activity. Rev Latinoam Quím 2007;35:47.

[145] International Organization for Standardization. Oil of clover leaf [Syzygium aromaticum (Linnaeus) Merril and Perry, syn. Eugenia caryophyllus (Sprengel) Bullock and S. Harrison]. ISO-Directive 3141/1997, Geneva, Switzerland, 2002.

[146] Hwang YS, Chang BY, Kim DS, Cho HK, Kim SY. Effects of the Syzygium aromaticum L. extract on antioxidation and inhibition of matrix metalloproteinase in human dermal fibroblast. Asian Pac J Trop Biomed 2019;9:53-59.

[147] Gbenou JD, Ahounou JF, Akakpo HB, Laleye A, Yayi E, et al. Phytochemical composition of Cymbopogon citratus and Eucalyptus citriodora essential oils and their anti-inflammatory and analgesic properties on Wistar rats. Mol Biol Rep 2013;40:1127-1134.

[148] Li M, Liu B, Bernigaud C, Fischer K, Guillot J, et al. Lemongrass (Cymbopogon citratus) oil: A promising miticidal and ovicidal agent against Sarcoptes scabiei. PLOS Negl Trop Dis 2020; 14:e0008225.

[149] Wisdom NN, Bassey EE, Jelani FB, Ishaku GA, Uwem UM, et al. Biochemical Studies of Ocimum sanctum and Olax subscorpioidea leaf extracts. J Pharm Res Int 2016;12:1-9.

[150] Ogboru RO, Akideno LO, Owoeye EA. Chemical composition and medicinal potentials of the bark of Erythrophleum ivorense A. Chev J Biosci Biotechnol Discv 2017;2:15-20.

[151] Akanji OC, Sonibare MA. Evaluation of wound healing activity of Erythrophleum suaveolens (Guill. & Perr.) brenan and Moringa oleifera Lam. on infected albino rats. European J Med Plant Res 2015;67-76.

[152] Christy AO, Bamidele A. Phytochemical, mineral contents and proximate compositions of the stem bark of Erythrophleum Suaveolens brenan (Guill. & Perr.). IRE J 2020;3:89-97.

[153] Mahmood AA, Sidik K, Salmah I. Wound healing activity of Carica papaya L. aqueous leaf extract in rats. Int J Mol Med Adv Sci 2005;1:398-401.

[154] Niranjan A, Prakash D. Chemical constituents and biological activities of turmeric (Curcuma longa l.)-a review. J Food Sci Technol 2008;45:109.

[155] Thangapazham RL, Sharma A, Maheshwari RK. Beneficial role of curcumin in skin diseases. Adv Exp Med Biol 2007;595: 343-357.

[156] Fadus MC, Lau C, Bikhchandani J, Lynch HT. Curcumin: An age-old anti-inflammatory and anti-neoplastic agent. J Tradit Complement 2017;7:339-346.

[157] Gupta A, Ansari S, Gupta S, Narwani M, Gupta M, et al. Therapeutics role of neem and its bioactive constituents in disease prevention and treatment. J Pharmacogn Phytochem 2019;8:680-691.

[158] Falana MB, Nurudeen QO. Analysis of secondary metabolites and in vitro evaluation of extracts of Carica papaya and Azadirachta indica leaves on selected human pathogens. Not Sci Biol 2020;12:57-73.

[159] Pandey IP, Ahmed SF, Chhimwal S, Pandey S. Chemical composition and wound healing activity of volatile oil of leaves of Azadirachta indica A. Juss. Adv Pure Appl Chem 2012;1:62-66.

[160] Cavalcante GS, Morais SM, André WP, Araújo-Filho JV, Muniz CR, et al. Chemical constituents of Calotropis procera latex and ultrastructural effects on Haemonchus contortus. Rev Bras DE Parasitol Vet 2020;29:e001320.

[161] Aderounmua AO, Omonisib AE, Akingbasotec JA, Makanjuolad M, Bejide R, et al. Wound-healing and potential anti-keloidal properties of the latex of Calotropis procera (Aiton) Asclepiadaceae in rabbits. Afr J Tradit Complement Altern Med 2013;10:574-579.

[162] EL-Kamali HH. Medicinal plants in east and central Africa: challenges and constraints. Ethnobot leafl 2009;2009:12.

[163] Templer SJ, Brito MO. Bacterial skin and soft tissue infections. Hospital physician 2009; 26:9-16.

[164] Mathieu D, Linke JC, Wattel F. Non Healing Wounds. In: Handbook on hyperbaric medicine, Mathieu DE (ed). Springer. Netherlands 2006; p 812.

[165] Menke NB, Ward KR, Witten TM, Bonchev DG, Diegelmann RF. Impaired wound healing. Clin Dermatol 2007;25:19-25.

[166] Borokini TI, Ighere DA, Clement M, Ajiboye T, Alowonle A. Ethnobiological survey of traditional medicine practices in Oyo State. J Med Plant Res 2013;1:1-6.

[167] Weldegerima B. Review on the importance of documenting ethnopharmacological information on medicinal plants. Afr J Pharm Pharmacol 2009;3:400-403.

[168] Sofowora EA. Plants In African Traditional Medicine-An Overview. In: W.C. Evans, (Eds.), Trease and Evans Pharmacognosy. 15th ed. Saunders an imprint of Elsevier. India 2008; pp 488-496.

[169] Ajibesin KK. Ethnobotanical survey of plants used for skin diseases and related ailments in Akwa Ibom State, Nigeria. Ethnobot Res Appl 2012;10:463-522.

[170] Abbasi AM, Khan MA, Ahmad M, Zafar M, Jahan S, et al. Ethnopharmacological application of medicinal plants to cure skin diseases and in folk cosmetics among the tribal communities of North-West Frontier Province, Pakistan. J Ethnopharmacol 2010;128:322-335.

[171] Passero LF, Laurenti MD, Santos Gomes G, Soares Campos BL, Sartorelli BP, et al. In vivo antileishmanial activity of plant based secondary metabolites. In: Fighting Multidrug Resistance with Herbal Extracts, Essential Oils and Their Components. 1st ed. Oxford: Academic Press. 2013; pp 95 107.

[172] Gbadamosi IT, Egunyomi A. Ethnobotanical survey of plants used for the management of sexually transmitted infections in Ibadan, Nigeria. Ethnobotany Res Appl 2014;12:659-669.

[173] Erinoso SM, Fawibe OO, Oyelakin AS, Ajiboye AA, Agboola DA. Herbal recipes used for the traditional management of infantile dermatitis in Odeda, Southwestern Nigeria. Afr J Tradit Complement Altern Med 2016;13:33-43.

[174] Mwangi VI, Mumo RM, Nyachieo A, Onkoba N. Herbal medicine in the treatment of poverty associated parasitic diseases: A case of sub-Saharan Africa. J Herb Med 2017;10:1-7.

[175] Silambarasan R, Sureshkumar J, Krupa J, Amalraj S, Ayyanar M. Traditional herbal medicines practiced by the ethnic people in Sathyamangalam forests of Western Ghats, India. Eur J Integr Med 2017;16:61 72.

[176] Taylor L. The Healing Power of Rainforest Herbs. Square one Publishers, Inc 2004

[177] Abdillahi HS, Van Staden J. Application of medicinal plants in maternal healthcare and infertility: a South African perspective. Planta Med 2013;79:591-599.

[178] Batawila K. Antifungal activities of five Combretaceae used in Togolese traditional medicine. Fitoterapia 2005;76:264-268.

[179] Bussmann RW, Glenn A. Medicinal plants used in Northern Peru for reproductive problems and female health. J Ethnobiol Ethnomedicine 2010;6:1-2.

[180] Nordeng H, Al-Zayadi W, Diallo D, Ballo N, Paulsen BS. Traditional medicine practitioners' knowledge and views on treatment of pregnant women in three regions of Mali. J Ethnobiol Ethnomedicine 2013;9:1-10.