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Review Article

A systematic review of medicinal plants used in Nigeria for hypertension management

OKUKWE CHRISTA OBODE[1,2], ABIODUN HUMPHREY ADEBAYO[1*], CONRAD ASOTIE OMONHINMIN[3], OMOLARA FAITH YAKUBU[1]

[1]Department of Biochemistry, College of Science and Technology, Covenant University Ota, Ogun State, Nigeria

[2]Nutrition and Toxicology Division, Federal Institute of Industrial Research Oshodi, Lagos, Nigeria

[3]Department of Biological Sciences, College of Science and Technology, Covenant University Ota, Ogun State, Nigeria

*Corresponding Author

Email ID: abiodun.adebayo@covenantuniversity.edu.ng

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ABSTRACT

Hypertension is a major health challenge in Nigeria and indeed worldwide. Managing hypertension is a huge burden as most persons living with the condition are either undiagnosed or undertreated due to poor health care or financial constraints. Although conventional antihypertensive drugs are available, the disease is still poorly managed. In Nigeria, herbal plants have played a major role in the management of diseases including hypertension. In this study, 136 medicinal plants used for hypertension management across the various ethnic communities in Nigeria which were accessed in open data sources until July 2018 were reported and presented systematically looking closely at their mechanism(s) of action. Analyses showed that the report was skewed towards the South-West, South-East and the North East of Nigeria and plants were mostly reported from communities in Sokoto and Edo states. Plants of the families of Fabaceae, Malvaceae, Apocynaceae and Euphorbiaceae were commonly used. Preliminary phytochemical evaluations revealed that 89.71% contained phenolic compounds, while 64.71 and 39.71% showed alkaloids and terpenes respectively. Plants whose antihypertensive mechanisms of action were reported, elicited either angiotensin-converting enzyme inhibition, diuretic effect, increased nitric oxide production, radical scavenging potentials, calcium channel blocking effects, decreased proliferation of the vascular smooth muscle cells, enhanced vasodilation, direct blood pressure lowering effects, renin inhibition or anti-inflammatory properties. It is hoped that this review will provide useful information to relevant institutions such as pharmaceutical industries, governmental agencies and most importantly the scientific community as this will serve as a guide that will lead to the discovery of new leads for hypertension management.

Keywords: Nigeria, hypertension, phytochemicals, medicinal plants, ethnobotanical use

INTRODUCTION

Hypertension is the persistent rise in blood pressure greater than 130/80mmHg for the systolic and diastolic measurements respectively [1]. It is the leading cardiovascular problem reported to be responsible for over 7 million early deaths worldwide [3]. It is accountable for about 16.5% of yearly deaths worldwide, with estimated predictions of about 23.5 million annual deaths by the year 2030 [4]. The predominant form of hypertension (primary hypertension; 90-95% of cases) has major contributing factors to its aetiology as a hyperactive nervous system, elevation of long-term high sodium intake including low dietary intake of calcium and potassium, high activity of the renin-angiotensin-system/deactivation of kallikrein kinin-system, endothelial dysfunctions as well as vascular remodelling [2]. There are many antihypertensive drugs in the market as at today however, despite the drug availability, hypertension is still poorly managed. Thus, raising serious concern to the scientific community. This observed trend has beenattributed to inaccessibility, high cost of medications, adverse effects such as dizziness,

impotence, headache, dry cough, etc [5-7]; thus, many persons resort to local herbs/plants for hypertension management.

Medicinal plants include all plant types employed in herbal medicine and they are considered the bedrock of traditional medicine [8]. They contain numerous chemical components (predominantly secondary metabolites) responsible for eliciting their protective/curative effects and are continually harnessed for the development of pharmaceutical drugs. Medicinal plants have been in use since the history of man and they are employed daily for managing various ailments like malaria, diabetes, cancer, diarrhoea etc. Several advantages (comparatively safe as well as synergistic effects) have been attributed to their use as against conventional drugs, thus their continued relevance cannot be overemphasized.

Given that the prevalence of hypertension is high and is been projected to go higher in the coming years, it is imperative that deliberate and concise

efforts be made scientifically, especially by the developing nations such as Nigeria, to investigate new, safe as well as effective medicinal plants that could help to curb the plague. In this review, the medicinal plants used for the management of hypertension in Nigeria is hereby reported. It further analyses plants that have been scientifically validated as antihypertensive agents (with reference to the mechanism of action of either crude extract or isolated bioactive compounds) and those that are only mentioned for ethnobotanical use which would require scientific validation.

MATERIALS AND METHODS

In this review, scientific databases such as Pubmed, ScienceDirect and Google Scholar were searched for available literature on medicinal plants used for the management of hypertension in Nigeria. While some of the publications were directly accessed, others were obtained through citations from other sources. Keywords, such as "hypertension", "medicinal plants", "antihypertensive", "mechanisms of action", "ethnobotanical", "different states in Nigeria" and "Nigeria" were used for the search. The literature that were used are those available before July 2018, and the search tried to highlight ethnobotanical use of the medicinal plants across the various geographical regions (North-East, North-West, North-Central, South-East, South-West, and South-South regions). The plants were thereafter categorized based on their families bringing to the fore those that have/haven't been validated for their folkloric claims as well as whether or not their mechanism (s) of antihypertensive action has been studied. Statistical analysis was performed using the Microsoft Excel, and Tableau Public - https://public.tableau.com.

RESULTS AND DISCUSSION

Information about the plants presented include; family, scientific and common names, plant part used/folkloric properties, phytochemicals, biological activities as well as antihypertension validation (Table 1). A total of 136 medicinal plants used to manage hypertension in Nigeria were identified and this spreads across 65 families with 28 being more frequently reported across the regions. Plants belonging to the families; Fabaceae, Malvaceae, Apocynaceae and Euphorbiaceae are more commonly used, being followed closely by plants from the Asteraceae, Annonaceae, Lamiaceae and Anacardiaceae families respectively.

Figure 1 shows the map of Nigeria indicating the states where reported plants are used for the management of hypertension. There were no specific reports available for all the states within the country, however, from the documented reports, all the geographical regions have been represented. Out of the 36 states of the nation, reports of plants used locally to manage hypertension were available for 17 states including Kano, Bauchi, Yobe, Borno, Sokoto, Nasarawa, Kogi, Enugu, Oyo, Osun, Ogun, Ondo, Ekiti, Lagos, Edo, Rivers and Akwa Ibom states. From the reports obtained, it was observed that a good number of the plants are located in Edo (62) and Sokoto (26), while Ogun (3) and Nasarawa (1) states had lesser number of plants reported for antihypertensive use. This is as shown in the Packed-bubbles chart (Figure 2).

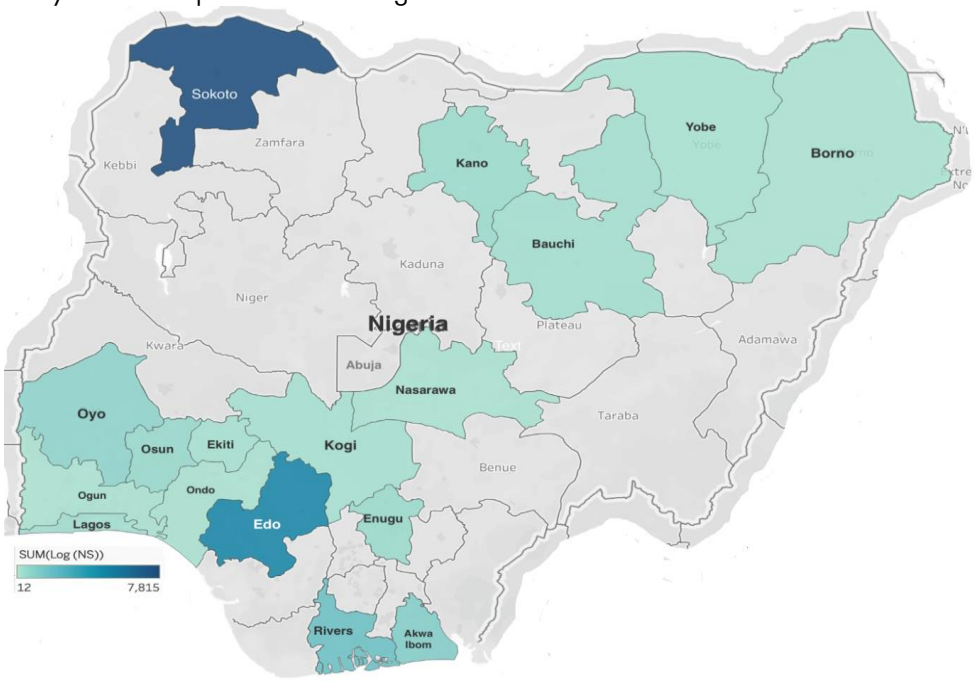

Fig.1: Plant spread across states of Nigeria.

Plants were reported in 17 States of the 36 states of Nigeria.

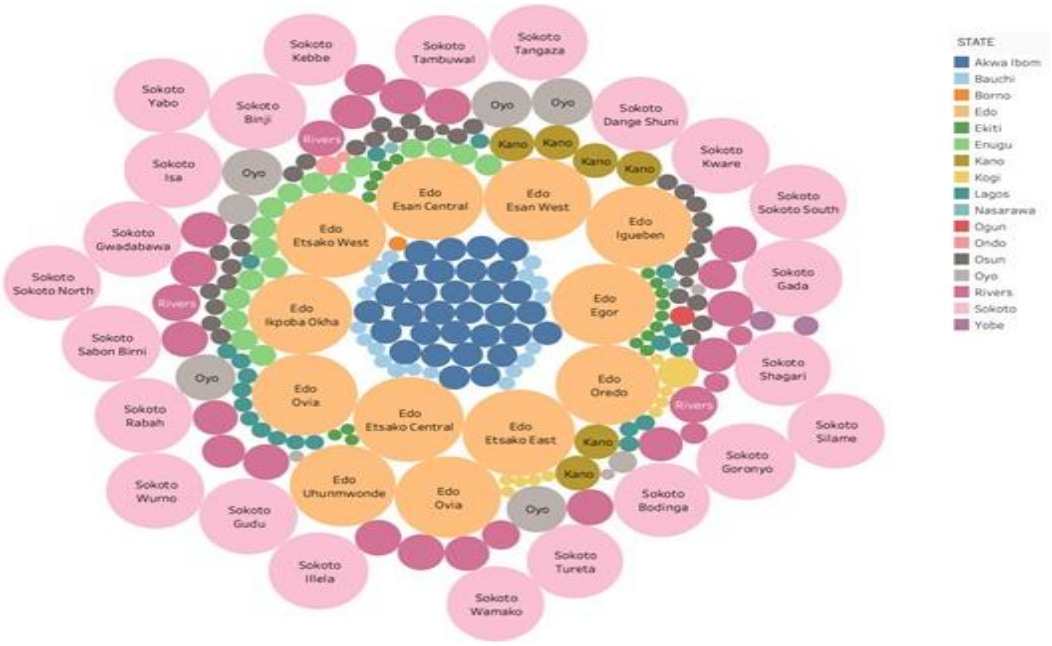

Fig.2: Packed-bubbles chart of the states and location of reported plants.

Sokoto and Edo states; and Ogun and Nasarawa states recorded the most and least locations respectively.

Out of the 136 plants reported in this review for the management of hypertension, 65 families were identified with 28 families being more frequently cited across the regions. These include Acanthaceae, Amaryllidaceae, Anacardiaceae, Annonaceae, Apocynaceae, Asclepiadaceae, Asphodelacae, Asteraceae, Bignoniaceae, Burseraceae, Crassulaceae, Euphorbiaceae, Fabaceae, Lamiaceae, Loganiaceae, Malvaceae, Menispermaceae, Moraceae, Musaceae, Piperaceae, Poaceae, Rosaceae, Rubiaceae, Rutaceae, Solanaceae, Verbenaceae and Zingiberaceae. It should also be noted that of the above-listed families, plants from the Fabaceae, Malvaceae, Apocynaceae and Euphorbiaceae were commonly cited, being followed closely by plants from the Asteraceae, Annonaceae, Lamiaceae and Anacardiaceae families respectively. However, based on the plant species themselves and not categorization by families, *A. sativum* (Amaryllidaceae) and *P. americana* (Lauraceae) were the most cited while *P. pinnata* (Sapindaceae) and *K. africana* (Bignoniaceae) showed the least cited plant species for the management of hypertension in Nigeria. Figure 3 shows the frequency treemap of plants reported.

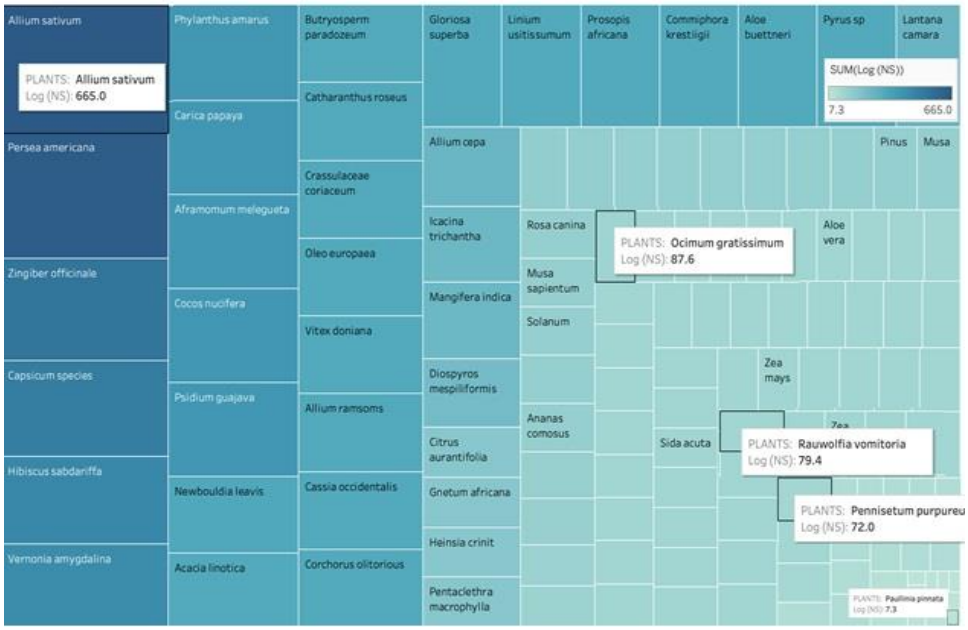

Fig.3:Frequency Treemap of reported plants across the states in Nigeria.

A. sativum and *P. americana*; *P. pinnata* and *K. africana,* the most and least cited plant species respectively for treatment of Hypertension.

The plant parts used include leaf, stem, root, and seed/bulb as well as fruit/whole plant/flower parts with 63, 22, 23, 13 and 12% of occurrence respectively. The plants reported for managing hypertension were also used to treat other ailments including diabetes, malaria, bacterial infections, rheumatism, etc. Plants can elicit these protective and curative properties due to the presence of chemical components (mainly secondary metabolites) which are commonly referred to as phytochemicals. Phytochemicals are classified into terpenes/terpenoids, phenolic compounds (which includes flavonoids, stilbenes, tannins, phenolic acids, etc.) as well as alkaloids [335]. Most of these compounds especially alkaloids and phenolic compounds have been reported to possess antihypertensive action [300]. From the preliminary phytochemical evaluations of the reported plants, it was observed that 89.71% had phenolic components, while 64.71 and 39.71% had alkaloids and terpene compounds respectively (Figure 4). Of this observed distribution, 28.68% presented with alkaloids and terpenes; 62.5% had alkaloids and phenolic compounds; while 39.71% had terpenes and phenolics present in them. Moreover, 13.24% contained phenolic compounds only, while 1.47% showed alkaloids only and 8.08% of the reported plants had no preliminary phytochemical composition reported. Plants such as *Catharanthus roseus, Voacanga africana*, *Gloriosa superba* as well as *Rauwolfia vomitoria* contain pharmacologically active alkaloids (ajmalidine, ajmaline, ajmalinine, rauwolfinine, reserpine, reserpiline, serpentine, yohimbine, yohimbinine, etc.), that have been developed into active drugs for the management of gout, cancer, hypertension, diabetes and other ailments [45, 113, 47].

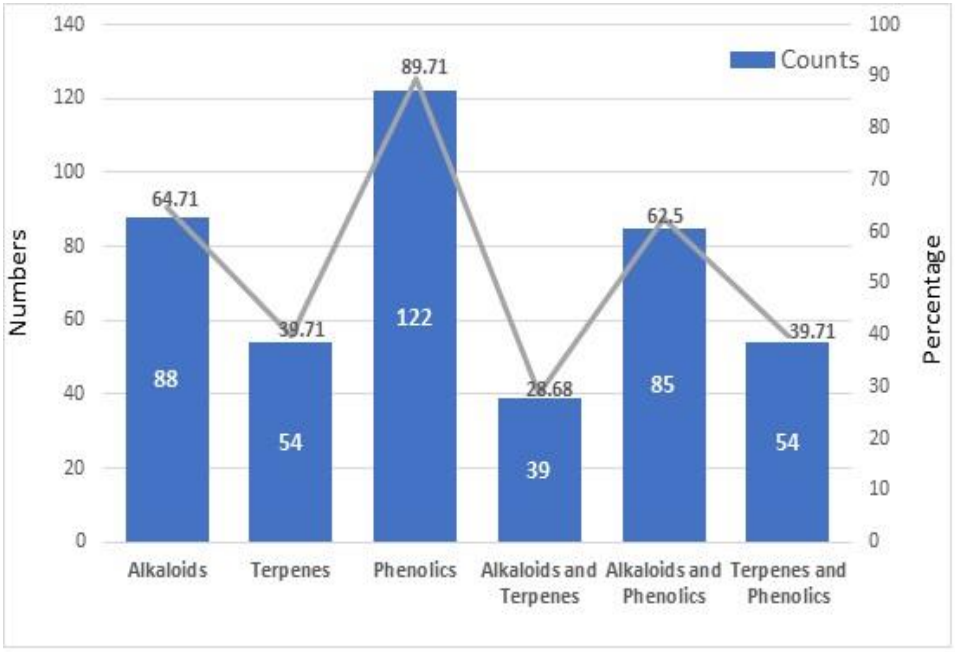

Fig.4: Phytochemicals reported in plants for management of hypertension across Nigeria.

Biological activities reported for most of the plants include antioxidant, diuresis and kaliuresis effect, antihyperglycemic, antidepressant, antifatigue, antidiabetic, antihyperlipidemic, nephroprotective, anti-inflammatory, neuroprotective, antibacterial, antiplasmodial, antifungal, antihypertensive, antidiabetic, anticancer properties, etc. However, for some of the plants including *Uvaria afzelii, Pastinaca sativa, Aristolochia repens, Harugana madagascatiensis, Linum usitatissimum, Pennisetum purpureum, Sorghum caudatum,* and *Pausinystalia yohimbe,* no scientific validation for their biological activities were documented. The folkloric use of the plants for hypertension management has been validated scientifically in 42.64% of the plants documented in this article. An attempt at understanding the mechanisms of antihypertensive action was recorded for 86 (63.24%) of the plants, while the remaining 36.76% are yet to be studied for their mechanism (s) of antihypertensive effect.

Table 1: Medicinal plants used in managing hypertension in Nigeria

S/N	Family Scientific Name	Common Name	Plant part used/Folkloric properties	Phytochemicals present/isolated bioactives	Biological activities/ Antihypertension validation	References
	Acanthaceae					
1	Brillantaisia patula	Brillantasia	Leaf, root Ease childbirth, menstrual pain, stomach ache, hypertension	Alkaloids, flavonoids, terpenoids, steroids, glycosides, tannins and saponins	Antibacterial, anti-plasmodial, hypoglycemic, analgesic, hepatoprotective, nephroprotective, cardiotonic effects None	[9-11]
2	Justicia schimperi	-	Leaf Hypertension, cough	Flavonoids, alkaloids and glycosides	Induce ovarian steroidogenesis and folliculogenesis None	[12-13]
	Amaranthaceae					
3	Aerva lanata	Mountain knotgrass	Whole plant Hypertension, diabetes, diuretic, demulcent, anthelmintic, antidiarrheal, anticholerin, hepatitis	Mostly alkaloids such as canthin-6-one and beta-carboline, aervine, methylaervine, aervoside and aervolanine. Beta-sito sterol, palmitic acid and alpha amyrin	Anthelmintic, demulcent, anti-inflammatory, diuretic, expectorant, hepatoprotective, nephroprotective, anti-diabetic, anti-hyperglycaemic, antimicrobial, cytotoxic, urolithiatic, hypoglycemic, anti-hyperlipidaemic, anti-parasitic, and antioxidant activities. Diuretic	[14-15]
	Amaryllidaceae					
4	Allium ascolonicum	Wild onion	Leaf Hypertension, diabetes, hyperlipidemia, bacterial and viral infections, fertility problems	Flavone, saponins, sulfur-containing compounds, and polyphenolic derivatives	Hypocholesterolemic, antioxidant, hypoglycemic, antifungal, antiproliferative, antiangiogenic, free radical scavenging, antimicrobial, antiinflammatory effects None.	[16-18]
5	*Allium cepa*	Onion	Leaf, bulb/root Hypertension, diabetes, wounds, heart diseases, hyperlipidemia, bacterial and viral infections	Kampferol, saponins, flavonoids, thiosulfur compounds, βsitosterol, ferulic acid, myritic acid, prostaglandins	Antidiabetic, antioxidant, antihypertensive, antithrombotic, hypoglycemic, antihyperlipidemic properties **Increased nitric oxide availability,**	[19-21]

					radical scavenging, calcium channel blocking	
6	*Allium sativum*	Garlic	Bulb/root Hypertension, diabetes, hyperlipidemia, bacterial and viral infections	Phenolics, flavonoids, saponins, ajoene, sulfur/non-sulfur containing bioactives	Antidiabetic, antioxidant, antitumor, anticancer, antihypertensive, anti-inflammatory effects. **Inhibition of ACE, decreased proliferation of vascular smooth muscle cells, increased nitric oxide bioavailability, increased production of hydrogen sulfide, enhanced cystathionine c-lyase (CSE) activity, thereby enhancing vasodilation**	[22-24]
7	*Allium romsons*	Wild garlic	Root Hypertension	-	-	[25]
	Anacardiaceae					
8	*Anacardium occidentale*	Cashew	Leaf, seed, stem Gastrointestinal disorders (acute gastritis, diarrhea), mouth ulcers, throat problems, hypertension	Alkaloids, saponins, lipids, polyphenols	Renal protection, molluscicidal, antidiabetic, anti-inflammatory, anti-urogenital infections, hypertension, antioxidant, cardioprotective effects. **ACE inhibition**	[26-27]
9	*Mangifera indica*	Mango	Leaf, stem Indigestion, diarrhea, liver disorders, asthma, anaemia, hypertension, bronchitis, cough	Polyphenols, flavonoids, triterpenoids Mangiferin (xanthone glycoside- is the major bioactive component).	Antioxidant, anti-inflammatory, antidiabetic, antitumor, antimicrobial, antiallergic as well as radioprotection. **ACE inhibition, enhanced nitric oxide production**.	[28-30]
10	*Spondias mombin*	Hog plum	Stem, root Diuretic, fever, emetic, diarrhea, dysentery, haemorrhoids, gonorrhoea and leukorrhea.	Flavonoids, phenolic compounds, lutein	Antioxidant, anti-inflammatory, gastroprotective, cardioprotective, enhancement of cognitive function. **ACE inhibition**	[31-33]
	Annonaceae					
11	*Annona muricata*	Soursop	Leaf, fruit, stem	Alkaloids, flavonol	Hypotensive, antioxidant, anti-	[34-36]

			Arthritis, fever, cancer, parasitic infections, diabetes, headaches	triglycosides, phenolics, megastigmanes, essential oils.	inflammatory, hypoglycemic, anticancer, smooth muscle relaxant, anti-arthritic, antihypertensive, hypolipidemic, antiparasitic. **ACE inhibition and calcium channel blocking**	
12	*Enantia chlorantha*	African yellow wood	Stem Malaria, cough, wound, jaundice, fever, hepatitis	Phenolic and flavonoid	Antimicrobial, antioxidant and antipyretic properties None	[37]
13	*Uvaria afzelii*	Monkey finger	Root Hypertension, viral infections	-	-	[38]
14	*Xylopia aethiopica*	African pepper	Leaf, seed, root Diabetes, dysentery, womb contractions/cleaning	Carbohydrates, glycosides, flavonoids, saponins, tannins and phytosterols	Anti-inflammatory, antimicrobial, hypolipidemic, antioxidant, antidiabetic, hypotensive, vasodilatory, diuretic and natriuretic effects. **ACE inhibition.**	[39-42]
	Apiaceae					
15	*Pastinaca sativa*	Parsnip	Leaf Hypertension	-	-	[38]
	Apocynaceae					
16	*Calotropis procera*	Auricular plant	Leaf Microbial infections, abdominal pain, liver problems	Sterols, tannins, flavonoids, cardiac glycosides, triterpenoids and alkaloids.	Anti-inflammatory, antioxidant, analgesic, antibacterial, anthelmintic, cytotoxic, insecticidal, antidiarrheal. **Vasorelaxant effects.**	[43-45]
17	*Catharanthus roseus*	Madagascar periwinkle	Leaf Diabetes, hypertension, microbial infections cancer, neuroinflammation	Mostly pharmacologically active alkaloids such as vinblastine, vincristine, ajmalicine, serpentine, vinorebine, vindolicine, vinflunine and vindesine	Antitumor, antispermatogenic, antimutagenic, antihypertensive, antioxidant, antifungal, antimitotic, anti-inflammatory, antihypercholesterolemic, diuretic, antimalaria, antihyperglycemic, antibacterial, antiviral, cardiotonic and CNS depressant **ACE inibition**	[46-48]
18	*Huntaria umbellate*	Husk tomato plant	Stem, seeds Fever, pain, abdominal colic and	Tannins, flavonoids, alkaloids, anthraquinone,	Antihyperglycaemic, anti-inflammatory, antioxidant,	[49-51]

			discomforts, diabetes mellitus and obesity, immune booster, hypertension.	cardiac glycosides, phlobatannins and saponins. Pharmacologically active indole alkaloids isolated	antiobesity, antimicrobial, antihyperlipidemic, Cardioprotective, penile-protective, antipyretic/analgesic **Inhibition of phosphodiesterase-5 (PDE-5) and nitric oxide**	
19	*Rauwolfia vomitoria*	Swizzle stick	Leaf, stem, root Hypertension, fever, general weakness, gastrointestinal diseases, liver diseases, psychosis, pain, and cancers	Alkaloids, saponins, inulins, tannins, flavonoids and cardiac glycosides	Antidiabetic, antihypertensive, antidepression, anticancer, antipsychotic, antigastric secretion, antipsychotic, antioxidant effects. *Binding to vesicular monamine transporters*	[52-53]
20	Voacanga africana	Small-fruited voacanga	Stem, root, seeds Malaria, diarrhea, infant convulsion, inflamations, mental and heart problems.	Pharmacologically active indole alkaloids isolated	Antimicrobial, antiulcer, anti-angiogenic **None**	[54-56]
	Araceae					
21	*Xanthosoma sagittifolium*	Cocoyam	Leaf, Hypertension, obesity and diabetes	Flavonoids	Antihyperlipidemia, antioxidant, antihyperglycemia, antihypertensive, prebiotic **None**	[57-58]
	Arecaceae					
22	*Cocos nucifera*	Coconut	Leaf , stem, fruit-water Hypertension, dyspepsia, diarrhea, dysentery, diabetes, haemoptysis and strangury.	Phenols, tannins, leucoanthocyanidins, flavonoids, triterpenes, steroids, alkaloids.	Antihypertensive, analgesia, vasodilation, antineoplastic, protection of kidney, heart, and liver functions, protection against ulcers, anti-inflammatory, anti-oxidant, antiosteoporosis, bactericidal, antihelminthic, antimalarial, leishmanicidal, antifungal, antiviral activities, cytotoxic, antidiabetes, antihyperglycemia, **Vasorelaxant and enhanced hemodynamic effects**	[38, 25, 59]
	Aristolochiaceae					
23	*Aristolochia repens*	Snake wort	Leaf, stem	-	-	[38, 60]

			Hypertension, pile, dysentary, stomach ache, diarrhea, diabetes			
	Asclepiadaceae					
24	*Gongronema latifolium*	Bush buck	Leaf, stem Malaria, diabetes, hypertension, and as laxative	Glycosides, alkaloids, saponin, tannin and flavonoids	Hypoglycaemic, hypolipidaemic, antidiabetic, antihypertensive and antioxidative effects **ACE and renin inhibition**	[61-62]
25	*Leptadenia hastata*	-	Whole plant Hypertension, catarrh, skin diseases, milk drying, sex-impotence, trypanosomosis, acute rhinopharyngitis and wounds, against polydipsia and mouth dryness, stomach upset, gonorrhea	Tannins, saponins, proanthocyanidins, phenolic glycosides, flavonoids, and alkaloids.	Antimicrobial, Anti-androgenic, anti-inflammatory, anti-diabetic, cytotoxic, antioxidant. **None**.	[63-64]
26	Parquetina nigrescens	-	Leaf Hypertension, diabetes, diarrhoea, rickets, intestinal worm infections, skin lesions, insanity, gonorrhoea, menstrual disorders, erectile dysfunction as well as aphrodisiac	Alkaloids, Phenolics, Saponins, Cardiac glycosides, Tannins, Phlobatannins, Steroids, Flavonoids, Anthraquinones, Triterpenes, Cardenolides	Antisickling, uterotonic, aphrodisiac, antioxidant, anti-ulcer, antihyperglycemic, erythrocyte membrane stabilizing, antilipogenic, erythropoietic, antimicrobial, analgesic anti-inflammatory and antipyretic activities as well as protects against cardio- and nephrotoxicities. **None**.	[65-67]
	Asphodelaceae					
27	Aloe buettneri	Western African Aloe	Leaf Chronic skin ulcers, coughs, dysmenorrhea, food poisoning, intestinal worms, difficult delivery, dysentery, general stomach aches, and lumbar pain	Quinones, tannins, flavonoids and alkaloids	Anti-ulcer, wound-healing and anti-inflammatory **None**	[68-69]
28	Aloe vera	True aloe	Leaf Hypertension, diuretic, diabetes, skin problems, stomach problems	Tannin, Saponin, Flavonoids and Terpenoids	Antidiabetic, hypoglycemic, hypolipidemic, antimicrobial, anti-inflammatory, Cardioprotective ACE inhibition	[70-73]

	Asparagaceae					
29	*Beaucarnea recurvata*	Ponytail palm	Root, leaf Hypertension	Flavonoids, Steroidal saponins	Inhibition of cyclic AMP **None.**	[74-75]
	Asteraceae					
30	*Lactuca capensis*	Wild lettuce	Whole plant Hypertension	Alkaloids, phenols, tannins and steroids	Antibacterial **None.**	[76-77]
31	Senecio biafrae	English spinach	Root, stem Stop bleeding, treat sore eyes, smallpox, diabetes or pulmonary defects, cough, heart troubles, rheumatic pain, or localized oedemas	Alkaloids, reducing sugars, cardiac glycosides, steroids, flavonoids and saponins	Hepatoprotective, antioxidant, ovarian folliculogenesis, puberty-inductive, antianemic, hypoglyceamic and hypolipideamic. **None**	[78-80]
32	Tridax procumbens	Coat bottons	Leaf, stem Hypertension	Alkaloids, flavonoids, essential oils	Antipyretic, antioxidant, antidiabetic, anti-inflammatory, hepatoprotective, antihypertensive **Direct vasorelaxation**	[81-82]
33	Vernonia amygdalina	Bitterleaf	Leaf Diabetes, malaria, hypertension, cough, blood tonic.	Flavonoids, saponins, tannins, oxalates, sesquiterpene lactones, phenolic acids, xanthones,	Antibacterial, antimalarial, antifungal, anticancer, antioxidant, hypoglycemic, hepatoprotective, analgesic, antihypertensive **ACE inhibition, direct vasorelaxant effects**	[83-86]
	Bignoniaceae					
34	*Kigelia Africana*	Susage plant	Leaf, seed, fruit Dressing for wounds, treatment of haemorrhage and rheumatism, veneral diseases, stomach ailments, ulcers, skin infections, hypertension, diabetes and pneumonia.	Iridoids, naphthaquinones, isocoumarins, lignans sterols, monoterpenoidnapht-haquinones, and flavonoids	Antidiarrheal, antioxidant, anti-inflammatory, analgesic, antifungal, antibacterial, antiulcer, anticancer, postpartum haemorrhage, pneumonia, molluscicidal, antimalarial, syphilis and gonorrhea. **None.**	[87-89]
35	*Newbouldia laevis*	Boundary tree	Leaf, stem, root Fevers, wound healing, stomach ache, arthritis, sexually transmitted infections, malaria, skin infections, tooth ache, cancer, cough, constipation, convulsion, pain,	Carbohydrates, flavonoids, reducing sugars, alkaloids, tannins, resin, proteins, oil, and acid compounds	Antimicrobial, antimalaria, antioxidant, anticancer, antihypertensive, wound healing, sedative, anticonvulsant, analgesic, antiinflamatory, hepatoprotective, anticoagulant,	[90-91]

			hypertension, sorefeet, ulcer, epilepsy, migraine, elephantiasis, sickle cell anaemia, as a febrifuge, as a vermifuge, aphrodisiacs, eye problems, snake bites, diabetes, rheumatism		uterine contraction, antiulcer, antisickling, hypoglycemic and antinociceptive. **Hemodynamic effects**	
	Boraginaceae					
36	*Heliotropium indicum*	Indian heliotrope	Whole plant Hypertension, abdominal pain, convulsion, cataract, conjunctivitis, cold, ulcer, fever	Pyrolizidine Alkaloids, Indicine-N-Oxide, Tannins, Saponins and Heliotrine	Antibacterial, antitumor, uterine stimulant effect, antifertility, wound healing, anti-inflammatory, histo-gastroprotective, anti-glaucoma, antinociceptive and diuretic activities **Hypotensive effects**	[92-93]
	Brassicaceae					
37	*Brassica nigra*	Black mustard	Leaf Hypertension, rheumatism/joint pains, liver and spllen inflammation, throat tumors, laxative	Volatile oils, anthraquinones, flavonoids and tannins	Antibacterial, antioxidant, anti-inflammatory, antidiabetic activities **None**	[94-96]
	Bromeliaceae					
38	*Ananas comosus*	Pineapple	Leaf, fruit Hypertension, diabetes, stomach problems, weight loss, typhoid fever, joint pains	Saponins, flavonoids, glycosides and tannins	Antitumor, inhibition of platelet aggregation, antiinflammatory action, antidiabetic, antihyperlipidemic and antioxidative, cardioprotective, enhanced insulin sensitivity, skin debridement properties **Diuretic, ACE inhibition, enhanced nitric oxide production, antiinflammatory**	[97-99]
	Burseraceae					
39	*Commiphora kerstingii*	African myrrh	Stem Fever, cancer, measles, asthma, rheumatism, veneral diseases	Alkaloids, phenols, tannins, anthraquinones, cardiac glycosides, saponins and volatile oils.	Antioxidant, antibacterial activities **None**	[100-101]
40	*Dacryodes edulis*	Bush pear	Leaf, stem, fruits, seeds Malaria, diabetes, dermatological,	Alkaloids, tannins, Saponins, cyanogen glycosides,	Antioxidant, antihyerglycemic, antibacterial properties	[102-103]

			oral and ear conditions, dysentery, anemia hypertension, leprosy, labor pain, retarded growth and epilepsy in children	flavonoids, anthrauinones, cardiac glycosides, steroids and phytates	**None**.	
	Caricaceae					
41	*Carica papaya*	Pawpaw	Leaf, seed Kidney stones, hypertension, diarrhea, fever, urinary tract infections, diabetes	Alkaloids (carpain, pseudocarpain), saponins, flavonoids (quercetin, clitorin, rutin), polyphenols	Hepatoprotective, antimalarial, antifertility, antiamoebic, diuretic, immunomodulatory, antifungal, antimicrobial, anthelminthic, antihypertensive **ACE inhibition, diuretic**	[104-107]
	Chrysobalanaceae					
42	*Parinari spp*	Burada	Leaf, fruits, stem Hypertension, dyspores, diuretic, expectorant, sedative, inflammation, anemia, vaginal douches, dandruff, itchy scalp, washing clothes, and cough	Saponins, alkaloid, tannins, steroid, flavonoid, carbohydrate, balsams, cardiac glycosides, and terpenes	Antibacterial **None**	[108]
	Clusiaceae/Guttiferae					
43	*Garcinia kola*	Bitter kola	Seed, leaf, stem Diabetes, cough, hypertension, fertility issues, sore throat, malaria	Biflavonoids, flavonoids, ben zophenones, xanthones, and organic acids	Hepatoprotective, gastroprotective, hypolipidemic, hypoglycemic, vasorelaxant, anti-inflammatory, anti-parasitic, antimicrobial, antimalarial, neuroprotective, immunomodulatory, cardioprotective and antiviral properties **Calcium channel blocking, antioxidant effect**	[109-111]
	Colchicaceae					
44	*Gloriosa superba*	Flame lily	Leaf, seeds Arthritis, gout, rheumatism, labor induction, inflammation, hypertension, ulcers, bleeding piles, skin diseases, leprosy, impotency, snakebites	Alkaloids (mainly superbine, colchicine, gloriosine), sterols (gloriosol, phytosterils and stigmasterin), flavonoids, tannins, and glycosides	Antimicrobial, anti-inflammatory, mutagenic, hepatoprotective, antioxidant, anticoagulant, anthelminthic, antifungal properties **None**	[112-113, 25]

	Combretaceae					
45	*Combretum racemosum*	Bush willow/ Christmas rose	Leaf Ulcers, helminthic infections, trypanosome infections, and bacterial infections of the genitourinary and gastrointestinal systems, haemorrhoids, convulsive coughing, tuberculosis, toothache and male sterility	Alkaloids, steroids, cardiac glycosides, saponins and tannins.	Antimicrobial, antiulcerative, antiinflammatory, vasorelaxant, antioxidant and trypanocidal properties **Endothelium-dependent vasorelaxant effects**	[114-116]
	Crassulaceae					
46	*Bryophyllum pinnatum*	Resurrection plant	Leaf, root Hypertension diabetes mellitus, bruises, wounds, boils, abscesses, insect bites, arthritis, rheumatism, joint pains, headaches, and body pains.	Phenols, phenylpropanoids, flavonoids, triterpenoids, steroids, saponins and alkaloids	Anti-inflammatory, antinociceptive and antidiabetic, CNS depressant, antimicrobial, antileishmanial, anthelmintic, antianaphylactic, antitumorous, gastroprotective and antiulcerous, hepatoprotective, hypotensive, anti-urolithiatic, immunomodulator and immunosuppressive and muscle relaxant. **Hemodynamic effects**	[117-119]
47	*Crassulaceae coriaceum*	Sedum	Stem Hypertension	-	-	[25]
	Cucurbitaceae					
48	*Momordica charantia*	Bitter melon	Seed, root, fruit Malaria, menstrual disorder, dysentery, leucorrhoea, hemorrhoid, hypoglycemia, jaundice, tumors, wounds, and antiviral diseases such as measles hepatitis, feverish conditions, abortion	Glycosides, saponins, alkaloids, fixed oils, triterpenes, proteins and steroids	Hypoglycaemic, antidiabetic, antioxidant, antiviral, anticancer, immunomodulatory, anthelmintic hypotensive, antihypertensive, renoprotective **Inhibition of ACE, radical scavenging, hemodynamic effects**	[120-122]
	Dichapetalaceae					
49	*Dichapetalum guineese*	-	Root Hypertension, malaria, infectious diseases	-	Antiplasmodial, antimicrobial, antioxidant activities **None**	[123-124]

	Ebenaceae					
50	*Diospyros mespiliformis*	Jackal berry	Stem, leaf, fruit, root tonic, powder, asthma, dermatitis, hypertension, atherosclerosis, lumbago, hemorrhage, insomnia, biliousness, malaria, wound healing, diarrhea, skin infections	Anthraquinones, tannins, triterpene, saponins, steroids, phenols, volatile oils, alkaloids, sugars	Antipyretic, analgesic, and anti-inflammatory, antihypertensive **Calcium channel blocking**	[125-127]
	Euphorbiaceae					
51	*Acalypha godseffiana (wilkesiana)*	Copper leaf	Leaf, seed Hypertension, diabetes, gastrointestinal problems, headache, malaria	Alkaloids, carotenoids, catechins and flavones, saponins and tannins	Anticancer, anti-inflammatory, antimicrobial, hypoglycemic and antihypertensive. **Diuretic, hemodynamic effects**	[128-129]
52	*Alchornea cordifolia*	Christmas bush	Leaf High blood pressure, hemorrhoids, pain, inflammation, fertility problems	Fatty acids, phenolic acids, flavonoids, steroids, terpenoids, tannins and alkaloids	Antibacterial, analgesic, anti-inflammatory, antidiabetic, antioxidant, antidepressant, hepatoprotective activity and anti-plasmodial activity. **Vasorelaxant effects**.	[130-131]
53	*Euphorbia hirta*	Asthma weed	Leaf Heartburn, diarrhea, vomiting, dysentery, hay fever, asthma, bronchitis, peptic ulcers, laryngeal spasms, emphysema, coughs, colds, edema, hypertension and kidney stones	Flavonoids, phenols, terpenoids, essential oils	Antibacterial, antitumor, anti-inflammatory, antifungal, antimalarial, antioxidant, antiasthmatic, diuretic. **Diuretic and ACE inhibition**	[132-134]
54	*Phyllanthus amarus*	Carry me seed	Leaf, fruit Jaundice, diabetes, gonorrhea, irregular menstruation, tachycardia, dysentery, spasmodic cough, itchiness, arthritis, otitis, swelling, skin ulcer and weakness of male organ	Alkaloids, flavonoids, hydrolysable tannins (Ellagitannins), major lignans, polyphenols, triterpenes, sterols and volatile oils	Antioxidant, anti-inflammatory, antihypertensive, hepatoprotective, antimicrobial, antidiarrheal, diuretic, anticancer, chemoprotection. **Hemodynmic effects, ACE inhibition**	[135-138]
55	*Ricinus communis*	Castor oil	Seed, leaf Intestinal worms, strangury, night blindness, hypertension, insect	Tannins, alkaloids, phlobatannins, flavonoids, steroids,	Antioxidant, anti-fertility, molluscicidal, insecticidal and larvicidal, antiulcer, anti-	[139-140]

			repellant, cathartic, aphrodisiac	terpenoids, saponins, cardiac glycosides. 45% of seeds consist of glycosides (ricinoleic, isoricinoleic, stearic and dihydroxystearic acids and also lipases and a ricinin)	inflammatory, hepatoprotective, wound healing, lipolytic, antidiabetic, immunomodulatory, antihistaminic activities **None**	
	Fabaceae					
56	*Abrus precatorius*	Rosary pea	Leaf. Malaria, respiratory tract infections, hepatitis, cough, typhoid, inflammation, sores, injuries from dog bite, diabetes, chest pain, hypertension, flu, eye infection, skin disease, bacterial and viral infections	Alkaloids, saponins, tannins, carbohydrates, triterpenes, flavonoids, proteins, glycosides and steroids.	Antioxidant, antimicrobial, antidiabetic, hepatoprotective, antimalarial, anti-inflammatory. **None**	[141-142]
57	*Caesalpinia bonduc*	Gray Nicker bean	Leaf Diabetes, hypertension, tumor, inflammation, facilitating childbirth	Alkaloids, flavonoids, triterpenoids, tannins as well as saponins	Antihypertensive, antipyretic, antibacterial, antidiabetic, hepatoprotective, abortifacient, anti-inflammatory. **Direct vasodilation**	[143-145]
58	*Cajanus cajan*	Pigeon pea	Leaf Hypertension, diabetes, dysentery, measles, liver disorders, sickle cell anemia.	Flavonoids and stilbenes with cajaninstilbene acid, pinostrobin, vitexin and orientin being more prominent	Antitumor, antimicrobial, antihyperglycemic, hepatoprotective, antioxidant, cardioprotective effects. **ACE inhibition, endothelin modulation**	[146-148]
59	*Erythrophleum suaveolens*	Ordeal tree	Seed, root, stem bark Hypertension, poultice for witches, inflammatory diseases	Tannins, steroids, alkaloids and saponins	Anti-inflammatory, diuretic, antibacterial, anesthetic, convulsant, cardiotonic, antiseptic, cytotoxic, antifungi and analgesic effects **ACE inhibition**	[149-150, 38]
60	*Glycine max*	Soybean	Leaf, seed Coronary heart disease, cancer, hypertension.	Saponins, isoflavones, flavonoids/polyphenol derivatives, tocopherols as well as anthocyanins	**Vascular effects** **ACE inhibition (seed extract)**	[151-153]
61	*Mimosa pudica*	Sensitive	Root	Steroids, alkaloids, tannins,	Analgesic, anti-inflammation,	[154-155]

		plant	Ulcers, inflammations, asthma, fevers, hypertension, jaundice	triterpenes, flavonoids, phenols, saponin, as well as glycosides	antidepressant, anti-implantation and anticonvulsant. **Diuretic**	
62	*Mucuna pruriens*	Velvet beans	Leaf Arthritis, cardiovascular diseases, diabetes, dysentery, fertility problems.	Amino acids, alkaloids, saponins, tannins, anthraquinones, terpenoids, flavonoids as well as cardiac glycosides. Levopoda (an amino acid, main bioactive)	Antioxidant, antilipemic, antidiabetic, antihypertensive, neurological effects, improves sperm quality. **Inhibition of ACE, hemodynamic, antioxidant effects.**	[15-158]
63	*Parkia biglobosa*	African locust bean	Leaf, seed, stem Arterial hypertension, cough, burn, abscess, piles/haemorrhages and bronchitis.	Sterols and triterpenes	**Vasorelaxation, hemodynamic effects, antioxidant, hypotensive effects, Cardioprotective.**	[159-161]
64	*Prosopis africana*	African mesquite	Leaf Menstrual and body pains, hypertension, migraine, vertigo, dysentery and rheumatism	Tannins, alkaloids, anthraquinones, flavonoids	Antitrypanosomial **None**	[162-163, 25]
65	*Senna occidentalis*	Septic weed	Leaf Hypertension	Saponins, sterols, alkaloids, flavonoids, resins, glycosides, anthraquinones as well as resins	Analgesic/antipyretic, antidiabetic, antimicrobial, antioxidant and hepatoprotective, anti-inflammatory, antimalaria properties and it is non-toxic. **Vasorelaxant effect.**	[164-165]
66	*Senna tora*	Foetid senna	Leaf Hypertension	Saponins, sterols, alkaloids, flavonoids, resins, glycosides, anthraquinones as well as resins	Antihelminthic, antibacterial, anti-inflammatory, antifungal, hepatoprotective, anticancer, antinociceptive. **ACE inhibition, vasorelaxant effect.**	[166-167, 165]
67	*Uraria picta*	Dabra	Leaf Hypertension, infections, diabetes	Alkaloids, flavonoids, steroids, terpenoids, cardiac glycosides, phenols, tanins, saponins	Improves insulin resistance **None.**	[168-169]
	Geraniaceae					
68	*Pelargonium graveolens*	Rose geranium	Seed, flower Dysentery, haemorrhoids,	Phenolics and flavonoids	Antioxidant, anticancer, uroprotective/antimicrobial	[170-172]

			inflammation, heavy menstrual flows, infections, hypertension, cancer		None	
	Gnetaceae					
69	*Gnetum africana*	Gnetum	Leaf and seeds Enlarged spleen, sore throat, reduction of labor pains, pile, hypertension	Alkaloids, saponins, glycosides and tannins phenolics, flavonoids, phytosterols	Hepatoprotective, antioxidant, chemopreventive, antifungal, antibacterial properties None.	[173-176]
	Hypericaceae					
70	*Harugana madagascatiensis*	Dragon blood	Leaf Hypertension	-	-	[75]
	Hypoxidaceae					
71	*Curculigo pilosa*	Curculigo	Root Hypertension, epilepsy, sterility, meteorism, stypsis, gastrointestinal issues, heart diseases hernia, genital infections and sexually transmitted infections, especially gonorrhea	Alkaloids, saponins, phenols, glycosides, tannins, cardenolides and traces of anthraquinones	Antioxidant, anticandidal None	[177-178]
	Icacinaceae					
72	*Icacina trichantha*	-	Leaf, seed, root Hypertension, measles, diabetes	Alkaloids, tannins, saponins	Antioxidant, antimicrobial, antidiabetic None.	[179-180]
	Lamiaceae					
73	*Gmelina arborea*	Beechwood	Leaf Hypertension, general infections, pain	Tannins, alkaloids, flavonoids, steroids, phlobatannins, glycosides, saponins, coumarines, anthocyanins	Antioxidant, antimicrobial, diuretic, anthihypertensive effects Radical scavenging, enhanced NO availability, vasorelaxant effect	[181-183]
74	*Ocimum gratissimum*	Scent leaf	Leaf Rheumatism, paralysis, epilepsy, high fever, diarrhea, sunstroke, influenza, gonorrhea and mental illness, expectorant, cough suppressant, hypertension, diabetes, stomach upset, dysentery	Alkaloids, saponins, tannins, phlobatannins, anthraquinones, steroids, terpenoids, flavonoids, cardiac glycosides, essential oils	Antifungal, antinociceptive, antioxidant, anticonvulsant, hepatoprotective, antidiabetic, antihypertensive, cardioprotective, immunostimulatory, antimutagenic, wound healing, anti-inflammatory, analgesic, antidiarrheal, leishmanicidal,	[184-185]

					antimicrobial. **Vasorelaxant effect**	
75	Origanum majorana	Sweet marjorum	Whole plant Hypertension, colds, respiratory allergies, gastrointestinal disorders, diabetes mellitus, wound healing and as a tranquilizer	Coumarins, flavonoids, tannins, steroids	Antioxidant, antimicrobial, antidiabetic, antihyperlipidemia **None**	[186-188]
	Lauraceae					
76	*Persea americana*	Avocado	Leaf, seed, stem, fruit Hypertension, diabetes	Saponins, tannins, flavonoids, cyanogenic glycoside, alkaloids, phenols, steroids	Anticancer, analgesic, anti-inflammatory, hypoglycemic, hepatoprotective, antihypertensive effects **Vasorelaxant effect, ACE inhibition**	[189-190]
	Linaceae					
77	Linum usitatissimum	Flax plant	Leaf Hypertension	-	-	[25]
78	Vitex doniana	Chasteberry	Leaf Hypertension, gastroenteritis, diarrhea, dysentery, fertility issues, eye troubles, liver disease	Saponins, tannins, anthraquinones, terpenoids, and flavonoids, alkaloids	Hepatocurative, antioxidant, hypotensive, antihypertensive, antidiarrheal **Hemodynamic effects**	[191-192]
	Loganiaceae					
79	*Anthocleista vogelii*	Cabbage tree	Stem Diabetes, typhoid fever, hypertension, hemorrhoids, hyperprolactinemia, malaria, chest pains, obesity, dysentery, abdominal pain, diarrhea, ulcer, jaundice, inflammations, asthma, hernia, cancer, wounds, rheumatism, infertility and skin diseases	Secoiridoids, alkaloids phytosterols, nor-secoiridoids, xanthones, triterpenes,	Antidiabetic, hypotensive, antiplasmodial, anti-obesity, antimicrobial, antioxidant, antitrypanosomal, spasmogenic, diuretic, antiulcerogenic, anthelmintic, analgesic, anti-inflammatory, fertility and laxative activities. **None**	[38, 193]
80	*Anthocleista djadonensis*	Cabbage tree	Root Constipation, hypertension, antidote for snake bites, malaria fever, gout, typhoid fever, hemorrhoids, syphilis, diabetes, laxative, purgative, stomach aches,	Tannins, saponins, carbohydrate, xanthones, phytosterols, triterpenes, alkaloids	Antidiabetic, diuretic, spasmogenic, antiplasmodial, anti-inflammatory, hypotensive, anti-obesity, anthelmintic, antiulcerogenic, analgesic, antioxidant, antimicrobial,	[193-194]

			dropsy, swellings, edema, venereal diseases, and contraceptive		antitrypanosomal, fertility and laxative activities. **None**	
	Loranthaceae					
81	*Tapinanthus bangwensis*	Mistletoe	Leaf, root Diabetes, blood pressure, asthma, epilepsy, breast/ovarian cancer and acquired immunodeficiency syndrome (AIDS)	Alkaloid, steroid, saponin, tannin and flavonoid.	Antibacterial, antidiabetic properties **None**.	[195-196]
	Malvaceae					
82	*Adansonia digitata*	Baobab	Leaf, stem, root Diarrhoea, microbial infections, malaria, fever, tuberculosis, anaemia, hypertension	Flavonoids, sterols, terpenoids, vitamins, lipids, carbohydrates and amino acids	Analgesic/antipyretic, antibacterial, anti-inflammatory, antioxidant, anti-insecticidal, antiviral, hepatoprotective. **Vasorelaxant effect**.	[197-199]
83	*Ceiba pentandra*	Silk cotton/kapok tree	Leaf, stem Laxative, hypertension, diarrhoea, localized oedemas, wash sores, furuncles, leprous macules, relieve stomach complaints, hernia, blennorrhoea, heart-trouble, asthma, gargles for gingivitis	Phenolics, alkanoids, flavonoid, tannin, saponnin, phytate, trypsin inhibitor, hemagglutinin inhibitor and oxalate	Antioxidant, hypoglycemic, antidiabetic **None**	[200-202]
84	*Corchorus olitorius*	Jute mallow	Seed Headaches, stomach problems, general pains, fevers, diuretic, purgative, childbirth, diabetes, heart disease, hypertension	Alkaloids, saponins, cardiac glycosides, phenols and flavonoids	Antioxidant, antidiabetic, antihypertensive. Angiotensin converting enzyme inhibition.	*[203-205]*
85	*Hibiscus rosa-sinensis*	Chinese hibiscus	Flower Hypertension, cancer progression, diabetes, hypercholesterolemia	Flavonoids, anthocyanins, tannin, quercetin, cardiac glycosides, flavonoids as well as terpenoids	Hypoglycemic, antioxidant, antibacterial, hair growth promoter, anticonvulsant, cardioprotective, antidiarrheal, anticancer, hypotensive, antiviral, antifertility effect, antipyretic, analgesic, anti-inflammatory. **None**.	[206-207]
86	*Hibiscus sabdariffa*	Roselle	Leaf, flower Hypertension, cancer progression, diabetes, hypercholesterolemia.	Anthocyanins, organic acids, flavonoids as well as polysaccharides.	Diuretic, antihypertensive, antidiabetic. **ACE inhibition, improved nitric**	[208-210]

					oxide production, blocks calcium channels, reduced uric acid production.	
87	*Hibiscus surattensis*	Bush sorrel	Flower Hypertension, cancer progression, diabetes, hypercholesterolemia.	-	Anti-inflammatory, analgesic, antioxidant, antidiarrheal. **None.**	[211]
88	*Sida acuta*	Broom weed	Leaf Diarrhea, malaria, headache, cold, hypertension, liver problems	Tannins, saponins, alkaloids, flavonoids, terpenoids as well as phenolics	Antimicrobial, anti-plasmodial, hepatoprotective, analgesic, anti-inflammatory, vasorelaxant, cardiovascular protection, anti-diabetic, anti-obesity, nephroprotective, antioxidant. **Vasorelaxant, hypotensive effect.**	[212-214]
89	*Sterculia setigera*	Karaya gum tree	Leaf Malaria, jaundice, measles, hypertension, syphilis, tuberculosis and leprosy	Steroids, terpenoids, tannins, fatty acids, cardiac glycosides alkaloids, flavonoids, phenolic	Anti-tubercular, antifungal activities **None**	[215-217]
	Meliaceae					
90	*Khaya senegalensis*	Mahogany	Stem Diabetes, lipid disorders, malaria, hypertension, anemia, diarrhea, gastrointestinal diseases and fever	Saponins, tannins, alkaloids, glycosides, steriods, terpenoids and flavonoids	Antihyperglycemic, anti-inflammatory, hypertensive, antidiabetic properties **Vasoconstrictive**	[218-219]
	Menispermaceae					
91	*Chasmanthera dependens*	Chasmantera	Leaf, stem Diuretics, antigonococcal management of fractures, eye infections	Alkaloids, tannins, cardiac glycosides	Anti-ulcerogenic, analgesic, anti-inflammatory, antimicrobial, antifungal activities. **None.**	[220-222]
92	*Cissampelos pareira*	Velvet leaf	Stem, root Hypertension, menstrual problems, irregular heart beat, urinary tract infections, venereal diseases, uterine haemorrage, gastrointestinal problems, skin infections, wounds, conjunctivitis and diabetes	Polyphenols, tannins, alkaloids	Antinociceptive, antiarthritic, cardiotonic, anticancer, anti-inflammatory, antidiarrheal, antihemorrhagic, antifertility, antioxidant, neuroprotective, hepatoprotective, antioxidant, immunomodulatory, Cardioprotective and antitrypanosomal activities.	[223-226]

					Radical scavenging, calcineurine modulation	
93	*Cissampelos owariensis*	Velvet leaf	Whole plant Diarrhoea, diabetes, hypertension, dysentery, colic, and intestinal worms, menstrual problems, venereal diseases and infertility, labor induction, abortion, treat abscesses, ulcers and scabies, nose or eye drops to cure headache.	Alkaloids, flavonoids, resins, terpenes, balsams, tannins, phenols, saponins, sterols, cardiac glycosides and carbohydrate	Antioxidant, antidiabetic **None**	[227-229]
	Mimosoideae					
94	*Acacia nilotica*	Gum Arabic	Leaf Cancer, sclerosis, cold, congestion, leukoderma, cough, diarrhea, fever, gall bladder, hemorrhoid, hypertension, ophthalmia, tuberculosis, small pox, dysentery, leprosy, bleeding piles, and menstrual problems.	Alkaloids, steroids, volatile essential oils, phenols/phenolic glycosides, resins, oleosins, tannins and terpenes	Spasmogenic, carcinogenic, vasoconstrictor, antihypertensive, mutagenic, spasmodic, inflammatory, oxidant, platelet aggregatory, antiplasmodial, molluscicidal, anti-fungal, anti-microbial activities **Hemodynamic effects, calcium channel blockade**	[230, 25]
95	*Calliandra portoricensis*	Red powder puff	Root Laxative/worm expeller, abortion, hypertension, lumbago, pain relief, prostate diseases, constipation, gonorrhoea, in snuff to promote sneezing, relief of headaches and ophthalmic preparation	Saponins, tannins, flavonoids, digitalis glycosides, fatty acids and glycosides.	Anticonvulsant, antisickling, anthelminthic, antidiarrheal, antispasmodic, antipyretic, antirheumatic, analgesic, anticholigenic, antacid, antiulcer, molluscidal, antioxidant, antiangiogenic, antiproliferative, ovucidal and antimicrobial activities **None**	[231-233]
96	*Pentaclethra macrophylla*	African oil bean	Leaf, root Anthelmintics, gonorrhea, convulsion, analgesic, hypertension	Tannin, alkaloids, flavonoids, saponins, oxalate, cyanogenic glycosides, phenol and lipids	Antispasmodic, antibacterial, antimicrobial, analgesic and anti-inflammatory None	[234-235]
97	*Tetrapleura tetraptera*	Aidan tree	Tuber/rhizome Arthritis, diabetes, epilepsy,	Polyphenol, flavonoid, saponin, tannin, phytate	Cardiovascular, neuromuscular, hypotensive, analgesic, axiolity,	[236]

			jaundice, schistosomiasis, asthma, fever, malaria, microbial infections and pain inflammation and hypertension		anti-inflammatory, antibacterial, antimalarial, antidiabetic, hypoipidemic, molluscicidal **Vasorelaxant**	
	Moraceae					
98	*Ficus asperifolia*	Sandpaper	Leaf, stem Anthelmintic, purgative, hypertension	Alkaloid, saponin, phenol, tannin, cardiac glycoside, steroid, cardenolides and phlobatannins	Hepatoprotective, Cardioprotective, antibacterial, antioxidant, antiatherogenic, renoprotective, osteoprotective, hypolipidemic properties **None.**	[237-239]
99	*Ficus capensis*	Cape fig	Leaf Dysentery, oedema, leprosy, epilepsy, ricket, gonorrhoea, respiratory disorders fertility, hypertension	Tannins, phytates, saponins, alkaloids, terpenoids, flavonoids, phenolics	Antioxidant, anti-inflammation, antisickling, antimicrobial **ACE inhibition**	[240-242]
100	*Ficus exasperata*	Sandpaper fig	Leaf, root Hypertension, heamostative, ulcers, opthalmia, coughs and heamorrhoid	Flavonoids, tannins, saponin, steroids and phlobatannins	Antidiabetic, hypolipidemic, antifungal, antimicrobial, diuretic, hypoglycemic, antihypertensive, anti-inflammatory, antipyretic, antidiarrheal, antispasmodic, antinociceptive, antihyperlipidemia **ACE inhibition**	[243-246]
	Moringaceae					
101	*Moringa oleifera*	Drumstick tree	Stem, root, leaf Inflammation, paralysis, hypertension gastric discomfort, stomach ulcers, malnutrition, diarrhea, dysentery and skin infections	Flavonoid, anthraquinone, alkaloids, saponins, steroids, terpenoids, cardiac glycoside, anthocyanin, tannins and carotenoid	Antiinflammatory, hepatoprotective, antitumor, antipyretic, antiepileptic, antiulcer, antispasmodic, diuretic, antihypertensive and antioxidant properties **Calcium channel blocking**	[247-249]
	Musaceae					
102	*Musa paradisiaca*	Plantain	Leaf, stem, root, tuber Cough, bronchitis, anemia, anthelmintic, dysentery, antidote for snake bite, asthma, ulcers, burns, excessive menstrual flow, fever, diabetes, hypertension, kidney	Tannins, anthocyanins, saponins, sugars, sterols and triterpenes	Antioxidant, antiulcer, antidiabetic, wound healing, antiurolithiatic antihypertensive **ACE inhibition, radical scavenging, direct vascular effects**	[250-251]

			problems, gangrene, gout, head ache, hemorrhage, insomnia, intestinal parasites, sores, inflammation, syphilis, tuberculosis and warts			
103	*Musa sapientum*	Banana	Leaf, fruit, stem Dysentery, intestinal lesions in ulcerative colitis, diabetes, in sprue, uremia, nephritis, gout, hypertension, cardiac disease, eczema, as cool dressings for blister and burns, dysentery, menorrhagia, diarrhoea, dysentery, cholera, dysentery, diabetes, menorrhagia, anthelmintic, blood disorders, venereal diseases, inflammation, pain and snakebite	Saponins, flavonoids, terpenoids	Antibacterial, antidiarrheal, antiulcerartive, antihypertensive, antimicrobial, antioxidant, antidiabetic, diuretic, wound healing, antiallergic, hypoglycemic, hypocholesterolemic **Calcium channel blocking**	[252-253]
	Myrtaceae					
104	*Psidium guajava*	Guava	Leaf, fruit, stem Diarrheal, diabetes, hypertension, body pains, tooth problems	Tannins, triterpenes, phenols, flavonoids, carotenoids, fatty acids.	Antidiarrheal, antimicrobial, antidiabetic, antihypertensive, antioxidant. **Inhibition of xanthine oxidase, ACE and ROS, enhanced vasodilation and vasorelaxant effects.**	[117, 254-255]
105	*Syzygium aromaticum*	Clove bud	Seed Hypertension, cough, inflammation, pain, indigestion, toothaches, generalized stress, parasitic infestations, headache and blood impurities	Terpenoids, alkaloids, saponins, carbohydrates, flavonoids	Antiseptic, antioxidant, analgesic, antipyretic, antithrombotic, anticancer, neuroprotective, antinociceptive, anti-inflammatory, antimicrobial, antitubercular, antifungal, antiviral, cytotoxic, insect repellant and anaesthetic properties **ACE inhibition**	[256-258]
	Oleaceae					
106	*Olea europaea*	Olive	Leaf Hypertension, diabetes,	Flavonoids, triterpenes, iridoids, flavanones,	Antioxidant, antiproliferative/anticancer,	[259-261]

			atherosclerosis	biophenols, secoiridoids, benzoic acid derivatives, isochromans	antiatherogenic, antiinflammatory, antimicrobial, hypotensive, antihypertensive, diuretic, antiatherosclerotic, hypoglycemic antidiabetic, anticonvulsant, immunomodulatory, antimicrobial, antiviral, antinociceptive, analgesic, gastroprotective, antihyperglycemic and wound healing properties **ACE inhibition, hemodynamic effects**	
	Papilionoideae					
107	*Pterocarpus erinaceus*	Padauk wood	Stem Rheumatism, gastric ulcer, ulcer, dermatitis, hypertension, pain, diarrhea, dysentery, abortions,	Alkaloids, flavonoids, tannins, saponins, terpenes, steroid, phenol, cardiac glycosides, balsam	Anti-inflammatory, analgesic, antibacterial antioxidant, antidiarrheal, antidysentery, antimalarial, hemostatic effects **None**	[262-264]
	Pinaceae					
108	*Pinus caribaea*	Caribbean pine	Leaf Hypertension	-	-	[12]
	Piperaceae					
109	*Peperomia pellucida*	Shiny bush/ silver bush	Leaf, stem Diuretic, hypertension, kidney diseases	Alkaloids, cardenolides, saponins, tannins, flavonoids, essential oils and phytosterols	Hypoglycemic, anti-inflammatory, analgesic, antibacterial, hypotensive, anticancer. **Modulation of the endothelium and nitric oxide production**	[265, 3]
110	*Piper guineense*	Ashanti pepper	Leaf, fruit Stomach ache, fertility problems, pile, dysentery, hypertension, rheumatism, syphilis, common cold, diabetes, herpes zoster while the stem and fruits are used for treating cough	Flavonoids, cardiac glycosides, tannins, Inulin	Antioxidant, antidiabetic, antibacterial, antiviral, anti-atherogenic **ACE inhibition**	[266-268]
	Poaceae					
111	*Pennisetum purpureum*	Elephant grass	Whole plant Hypertension	Alkaloids, cyanogenic glycosides, flavonoids, saponin, tannins, oxalate,	-	[269-270]

				phytate		
112	*Sorghum caudatum*	Black-seeded sorghum	Leaf Antiabortive, anemia, hypertension, cyanogenetic, demulcent, diuretic, emollient, intoxicant and poison, cancer, epilepsy, flux and stomach ache, malaria, diarrhea, blood purification, sickle cell	Anthracine Glycosides, Glucosides, saponins, tannins, phenolics, alkaloids, sterols, terpenes, quinones	-	[271, 38]
113	*Sorghum bicolor*	Sorghum	Leaf Antiabortive, anemia, hypertension, cyanogenetic, demulcent, diuretic, emollient, intoxicant and poison, cancer, epilepsy, flux and stomach ache, malaria, diarrhoea	Anthracine Glycosides, Glucosides, saponins, tannins, phenolics	Hepatoprotective, hematopoietic, antihyperlipidemic **None**	[272-274]
114	*Zea mays*	Maize	Seed, corn silk Hypertension, prostate inflammation, diabetes, urinary tract infection, edema, obesity, relaxation of muscles	Flavonoids, alkaloids, phenols, steroids, glycosides, carbohydrates, terenoids an d tannins.	Antioxidant, diuresis and kaliuresis effect, antihyperglycemia, antidepressant, antifatigue, antidiabetic, antihyperlipidemia, nephroprotective, anti-inflammatory, neuroprotective effects **ACE inhibition**.	[275-277]
	Polygalaceae					
115	*Securidaca longepedunculata*	Violet tree	Root, stem bark Hypertension, diabetes, pain, arthritis, headache, rheumatism, cancer, tuberculosis, fertility issues in men, venereal diseases, abortifacient	Saponins, alkaloids, steroids, tannins, flavonoids, cardiac glycosides, anthraquinones, reducing sugars	Analgesic, anti-inflammatory, antihyperglycemic, hypoglycemic, hypotensive **Hemodynamic effects**	[278-280]
	Rosaceae					
116	*Pyrus species*	European pear	Leaf Hypertension, bladder inflammation, diuretic, urinary stones	Glycosilated hydroquinone (Arbutin), isoquercitrin, sorbitol, ursolic acid, astragalin and tannin	Antioxidant, antimicrobial, antidiabetic, antihyperglycaemic and antihyperlipidemic properties **None**	[25, 281-283]
117	*Rosa canina*	Dog rose	Leaf, stem Diuretic, laxative, anti-gout, antirheumatism, hypertension,	Fatty acids, triterpenes, flavonoids, carotenoids	Antiobese, anti-inflammatory, chondroprotective, antioxidant **None**.	[284-286]

			common cold			
	Rubiaceae					
118	*Crossopteryx febrifuga*	Ordeal plant	Leaf Dry cough, respiratory problems, pain, fever, dysentery, malaria, hypertension, diabetes	Steroids, cardiac glycosides, flavonoids, terpenoids, tannins, anthraquinones, alkaloids and saponnins	Antipyretic, analgesic, anti-inflammatory, gastroprotective, antimalarial and antimicrobial **None**.	[287-289]
119	*Heinsia crinita*	Jasmine gardenia	Root Bacterial infections, skin rashes, umbilical hernia, cough, catarrh, sore throat, diabetes, hypertension and infertility	Flavonoids, saponins, alkaloids, polyphenols, carotenoids, terpenoids	Neuroprotective, antioxidant, hepatoprotective, hypoglycemic, nephroprotective **ACE and arginase inhibition**	[290-292]
120	*Morinda lucida*	African peach	Leaf, stem bark, root Fever, cerebral congestion, diabetes, hypertension, ulcers, dysentery, stomach ache, leprosy, gonorrhea, jaundice, malaria, and diabetes	Anthraquinones, tannins, flavonoids and saponosides	Hypoglycemic, antihyperglycemic, neuroprotective, antioxidant, antiproliferative properties. **None**	[203, 293-294]
121	*Nauclea latifolia*	African peach	Leaf, stem, root Malaria, abortion induction, hypertension, cough, purgative, wounds, gonorrhea, diarrhea, diabetes	Saponins, flavonoids, indole alkaloids, monoterpenes	Antibacterial, antimalarial, cytotoxic, antihypertensive, hypotensive, antidiarrheal, spasmolytic, vasodilatory effects **Calcium channel blocking, renin inhibition, hemodynamic effects**	[295-296]
122	*Pausinystalia yohimbe*	Yohimbe	Leaf, stem Hypertension, sexual enhancement	-	-	[297]
	Rutaceae					
123	*Citrus aurantifolia*	Lime	Seed, fruit Hypertension, cardiovascular disease, cold, malaria	Coumarins, alkaloids, carbohydrates, flavonoids, steroids and tannins	Antioxidant, antihypertensive, hypotensive, antioxidant, hypocholesterolemic, antiosteoporotic **ACE inhibition, hemodynamic effects**	[298-300]
124	*Fagara zanthoxyloides*	Fagara	Root, leaf Toothaches, urinary and venereal disease, sickle cell, infections, hypertension, inflammation and pain	Alkaloids, steroids, tannins, saponins, flavonoids, lignans and carbohydrates	Hepatoprotective, nephroprotective, antimicrobial, cytotoxic, molluscicidal, anticonvulsant, antisickling, anaesthetic, antibacterial, antihypertensive and anti-	[301-303]

					inflammatory properties **None**	
	Santalaceae					
125	*Viscum album*	European mistletoe	Leaf Hypertension, headache, dizziness, palpitation, arthritis, epilepsy	Glycoprotein, polypeptides, saponins, flavonoids, flavonol agylcones, lectins, triterpenes, caffeic acid, lignans, choline derivatives, vitamin C, histamine, resins, thionins cardionolids and phenolic compounds	Antitumors, immunomodulatory, anticancer, antihypertensive, antiinflammatory, hypoglycemic, antioxidant, neurophysiological, cytotoxic, antimycobacterial properties **Vasorelaxant effect, enhanced NO production, calcium channel blocking**	[303-306]
	Sapindaceae					
126	*Paullinia pinnata*	Tietie	Leaf Abdominal colic, diarrhea, dysentery, malaria, erectile dysfunction, anemia, hypertension, gynaecological usages	Triterpene, alkaloids, flavonoids, tannins, saponins, steroids, polyphenols, cardiac glycosides and reducing sugars	Antidiarrheal, analgesic, antiinflammatory, antimicrobial, antioxidant, vascular relaxation. Endothelium-**dependent vasorelaxation**	[307-309]
	Sapotaceae					
127	*Butyrospermum paradoxum*	Shea tree	Leaf Hypertension, infections	Saponins, glycoside, alkaloids	Antimicrobial. **None**	[310, 25]
	Solanaceae					
128	*Nicotiana tabacum*	Tobacco	Leaf Antispasmodics, diuretics, emetics, expectorants, sedatives, and in rheumatic swellings, anesthetics, antibacterial, anticonvulsants, anti-fungal	Saponin, flavonoid, terpenoid, alkaloid and inulin	Analgesic, anesthetic, angiogenesis inhibition, antibacterial, anti convulsant, antiestrogenic, antifungal, antiglaucomic, antioxidant, antistress effect antiviral, aromatase inhibition, arrhythmogenic, antidepressant, antiobesity activities **None**.	[311-312]
129	*Capsicum species*	Pepper	Seed, fruit Infections, cold, hypertension, fertility issues, stomach upset	Phenolics, flavonoids, carotenoids, alkaloids, steroids, glycosides and capsaicinoids	Antiinflammatory, antidiabetic, anticancer, antiulcer, anticoagulant, analgesic, antiarthritis, immunomodulatory, memory enhancing, pain relief,	[313-314]

					hypolipidemic, hypocholesterolaemic, hepatoprotective and antimicrobial effects **ACE inhibition**	
130	*Solanum lycopersicum*	Tomato	Fruit Hypertension, stomach problems, cold	Carotenoids, flavonols, polyphenols	Antihypertensive, endothelium protective, antioxidant effects **Hemodynamic effects, antiplatelet aggregation, ACE inhibition**	[315-317]
	Talinaceae					
131	*Talinum triangulare*	Water leaf	Leaf, root Obesity, cardiovascular diseases, liver disease, cancer	Tannins, saponins, flavonoids, cardiac glycosides, alkaloids, phenolics.	Hepatoprotective, anticancer **Stimulates nitric oxide production**	[318-320]
	Urticaceae					
132	Musanga cecropioides	Umbrella tree	Leaf Lumbago, rheumatism, leprosy, chest infections, trypanosomosis, gonorrhea, cough, hypertension, labour induction, fever, jaundice, acute gastric poisoning, and liver diseases diabetes	Anthraquinones, reducing sugars, flavonoids, alkaloids, cardiac glycosides, phlobatannins, tannins, saponins	Uterotonic, antidiabetic, hypotensive, hypoglycemic, antiinflammatory, analgesic properties. **Inhibition of ACE and acetylcholine esterase, NO production, hemodynamic effects**	[321-323]
	Verbenaceae					
133	*Lantana camara*	Wild sage	Leaf Fevers, high blood pressure, colds, rheumatism, asthma, bronchitis, stomach ache	Flavones, tannin, coumarins, isoflavones, flavonoids, anthocyanins, lignans, catechins, isocatechins, alkaloids, saponins and triterpenoids	Antioxidant, antimicrobial, wound healing, antihelminthic, mosquito larvicidal, antifungal, antiviral, antipyretic, antihyperglycemic **None**.	[324-325]
134	*Stachytarpheta angustifolia*	Black snake weed	Leaf, whole plant Hypertension, sexually transmitted diseases, diabetes	Anthraquinone glycoside, free anthraquinone, saponin glycosides, triterpenoid, polyphenols	Hypoglycemic, antibacterial, antioxidant, immunomodulatory effects **None**.	[326-327]
	Zingiberaceae					
135	*Aframomum melegueta*	Alligator pepper	Leaf, seed Diarrhea, vomiting, stomach problems, hypertension, antidote	Alkaloids (piperine), essential oils (gingerol, shagaol and paradol),	Anti-inflammatory, anti-diarrheal, antioxidant, antibacterial, antihypertensive, enhancement of	[328-331]

			for snake bites	tannins, terpenoids	testicular function. **Direct vasodilation**	
136	*Zingiber officinale*	Ginger	Rhizome Arthritis, sprains, muscular aches, infectious diseases, rheumatism, pains, sore throats, cramps, hypertension, dementia, fever, catarrh, nervous diseases, gingivitis, gastric problems, toothache, asthma, stroke and diabetes	Tannins, phlobatannins, steroids, terpenes Saponins, flavonoids and alkaloids	Antiemetic, anticholinergic, antihistaminic, antioxidant, antiinflammatory, antiplatelet, hypoglycemic, hypolipidemoc, antihyperlipidemic, hypotensive, gastroprotctive **ACE inhibition, calcium channel blocking, vasodilation**	[332-334]

Furthermore, some enzymes especially those of the renin-angiotensin system (RAS) such as angiotensin-converting enzyme (ACE); arginase, nitric oxide synthase, cholinesterase and those involved in the oxidative stress pathway have been implicated in the pathophysiology of hypertension. The RAS is crucial in the regulation of blood pressure as well as volume homeostasis in hypertension and cardiovascular diseases thus, inhibiting the RAS pathway pharmacologically, is a critical strategy presently used in hypertension therapy [336-337].

The RAS pathway starts in the kidneys following the cleavage of angiotensinogen to angiotensin I by renin. Angiotensin I is inactive and can subsequently be converted to its vasoconstrictive form known as angiotensin II when acted upon by ACE [338-339]. Angiotensin II is a very essential regulator necessary for balancing sodium and fluid as well as modulating cellular growth and remodelling [340]. Angiotensin II acts through two main receptors namely angiotensin type-1 (AT_1) and type-2 (AT_2) receptors [341]. Binding of angiotensin II to AT_1 leads to vasoconstriction in vascular smooth muscle cells (VSMC), induces the release of aldosterone, thus increasing water and salt retention in the kidney; it also cause the enlargement of heart muscle cells leading to cardiac remodelling. Now, binding of angiotensin II AT_1 on endothelial and VSMCs leads to increase in calcium ion (Ca^{2+}) concentration as well as increased levels of big endothelin-1 (bET-1) [342]; which is then converted to endothelin-1 (ET-1) by the endothelin-converting enzyme (ECE). It has been reported that AT_1 is upregulated in pathological conditions of tissue remodelling and vascular inflammation [343-344]. When angiotensin II binds to AT_2, it leads to vasodilation releasing nitric oxide (NO) and inhibiting cell proliferation [345]. Some plants such as *Allium sativum, Anacardium occidentale, Mangifera indica, Annona muricata, Spondias mombin, Vernonia amygdalina*, etc., have been reported to possess ACE-inhibitory properties.

ACE is also implicated in the kallikrein-kinin system, where it renders bradykinin inactive [2]. Bradykinin is an important vasodilator in the system generating nitric oxide in endothelial cells as well as releasing prostaglandins for production of many vasodilators such as prostacyclins [346-347, 341, 2]. Inactivation of bradykinin by ACE reduces the amount of nitric oxide (NO) generated. NO, which is a potent vasodilator helps to inhibit the increase in the concentration of Ca^{2+} in VSMCs. Also, unavailability of NO due to increased superoxide generation by angiotensin II induces endothelial dysfunction and leads to increased blood pressure [348-350]. NO is produced by nitric oxide synthase (NOS) from L-arginine in the endothelial cells. Upon diffusion from endothelial to VSMCs, NO effects dilatory actions by activating soluble guanylyl cyclase (sGC) while increasing the intracellular concentration of cyclic guanosine-monophosphate (cGMP). Thus, inhibition of NOS leads to vasoconstriction and reduction in blood flow. Reduction in NO bioavailability can also result from the excessive generation of reactive oxygen species (ROS) especially superoxide anion (O_2^-). Ang II promotes superoxide formation in endothelial cells through activation of nicotinamide adenine dinucleotide phosphate (NADPH) oxidase. Superoxide reacts with NO forming peroxynitrite ($ONOO^-$), a very strong oxidant which causes tissue damage and ultimately cell inflammation and death. Excessive superoxide generation modifies tetrahydrobiopterin (BH_4) a cofactor for NOS, uncoupling NOS and generating more superoxide radicals. This then leads to decreased availability of NO, switching to oxidant-mediated redox signalling, stimulation of pro-inflammatory pathways and eventually vascular remodelling and hypertension [2]. It is of utmost importance therefore, for antihypertensive agents to possess ACE inhibitory effects, antioxidant/radical scavenging, anti-inflammatory as well as vasorelaxant effects.

The plants documented in this report whose mechanisms of antihypertensive action were reported elicited ACE inhibition, diuretic effect, increased NO production and availability, radical scavenging potentials, calcium channel blocking effects, decreased proliferation of the VSMCs, enhanced vasodilation, direct blood pressure lowering effects, renin inhibition and anti-inflammatory properties.

CONCLUSION

It is no longer news that hypertension rate is on the rise daily and this is affecting both the economic situation and general wellbeing of the society. From this review, it is clear that there are many plant resources in Nigeria being used for the management of several ailments especially hypertension, however many of these plants have not been validated scientifically for their antihypertensive mechanisms of action. Majority of the studies with the antihypertensive mechanism were either carried out with collaborations abroad or by scientists outside Nigeria. Although the toxicity profile of the plants is not within the scope of this review, it was observed that some plants which were reportedly toxic are still being used traditionally to manage hypertension. It was also observed that available scientific reports on a good number of the plants were plant species outside Nigeria, so whether or not there are variations in species cannot be ascertained. A lot of work still needs to be done in the areas of identifying the active principles responsible for the antihypertensive effect of most Nigerian medicinal plants as well as determining their mechanisms of action. Out of the 36 states of

the Nigeria, reports of plants used locally for the management of hypertension were available for 17 states, thus it would be necessary to conduct ethnobotanical/ethnopharmacological surveys in remaining 19 states to have a complete database of medicinal plants in Nigeria used for the management of hypertension. This could open up new areas of research for future research work for scientists in search of lead compounds for the development of medicines/drugs as well as functional foods in hypertension management. It is also recommended that governmental agencies and other relevant organizations such as pharmaceutical industries, national and international agencies should support researchers in these areas in order to harness the huge resources of medicinal plants which will help to improve the quality of life of the citizens in Nigeria.

CONFLICT OF INTEREST

There is no conflict of interest.

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REFERENCES

1. Armstrong, C. (2018). High blood pressure: ACC/AHA releases updated guideline. *American Family Physician*, 97(6), 413-415.
2. Majumder, K. & Wu, J. (2015). Molecular targets of antihypertensive peptides: understanding the mechanisms of action based on the pathophysiology of hypertension. *International Journal of Molecular Science,* 16, 256-283.
3. Nwokocha, C.R., Owu, D.N., Kinlocke, K., Murray, J., Delgoda, R., Thaxter, K., McCalla, G. & Young, L. (2012). Possible mechanism of action of the hypotensive effect of *Peperomia pellucida* and interactions between human cytochrome P_{450} enzymes. *Medicinal and Aromatic Plants* 1, 105-109.
4. World Health Organization. (2013). *A global brief on hypertension: silent killer, global public health crisis: World Health Day 2013* (No. WHO/DCO/WHD/2013.2). World Health Organization.
5. Susalit, E., Agus, N., Effendi, I., Tjandrawinata, R.R., Nofiarny, D., Perrinjaquet-Moccetti, T. & Verbruggen, M. (2011). Olive (*Olea europaea*) leaf extract effective in patients with stage-1 hypertension: comparison with Captopril. *Phytomedicine*, 18(4), 251-258.
6. Wang, J. & Xiong, X. (2012). Outcome measures of Chinese herbal medicine for hypertension: an overview of systematic reviews. *Evidence-Based Complementary and Alternative Medicine*, 2012, 1-7.
7. Meresa, A., Fekadu, N., Degu, S., Tadele, A. & Geleta, B. (2017). An Ethnobotanical review on medicinal plants used for the management of hypertension. *Journal of Clinical and Experimental Pharmacology,* 7, 228-244.
8. Singh, R. (2015). Medicinal plants: A review. *Journal of Plant Sciences: Medicinal Plants,* 3(1), 50-55.
9. Faparusi, F., Bello-Akinosho, M.M., Oyede, R.T., Adewole, A., Bankole, P.O. & Ali, F.F. (2012). Phytochemical screening and antibacterial activity of *Brillantaisia patula* leaf. *Research Journal of Phytochemistry*, 6, 9-16.
10. Anigboro, A.A., Avwioroko, O.J. & Tonukari, N.J. (2018). *Brillantasia patula* aqueous leaf extract averts hyperglycemia, lipid peroxidation, and alterations in haematological parameters in alloxan-induced diabetic rats. *International Journal of Biomedical Science and Engineering*, 6(2), 43-51.
11. Samy, M.N., Sugimoto, S., Matsunami, K., Otsuka, H. & Kamel, M.S. (2015). Chemical constituents and biological activities of genus Ruellia. *International Journal of Pharmacognosy*, 2(6), 270-279.
12. Lawal, I.O., Uzokwe, N.E., Ladipo, D.O., Asinwa, I.O. & Igboanugo, A.B.I. (2009). Ethnophytotherapeutic information for the treatment of high blood pressure among the people of Ilugun, Ilugun area of Ogun State, South-West Nigeria. *African Journal of Pharmacy and Pharmacology*, 3(4), 222-226.
13. Bassey, M.E. & Effiong, E.O. (2011). Preliminary investigation of herbs used in paediatric care among the people of Akwa Ibom State, Nigeria. *Journal of Natural Product and Plant Resources*, 1(3), 33-42.
14. Mariswamy, Y., Gnanaraj, W.E., Antonisamy, J.M., Adaikalam, A.A. & Jamesraj, V. (2013). GC-MS studies on methanolic extracts of *Aerva lanata* L. *American Journal of Pharmaceutical Research*, 3(3), 2687-2717.
15. Sridhar, N., Kiran, B.V.S. & Rudrapal, M. (2014). Diuretic potential of *Aerva lanata* and *Ecbolium ligustrinum* root extracts. *Asian Journal of Pharmaceutical Research and Health Care*, 6(2).
16. Wongmekiat, O., Leelarugrayub, N. & Thamprasert, K. (2008). Beneficial effect of shallot (*Allium ascalonicum* L.) extract on cyclosporine nephrotoxicity in rats. *Food and Chemical Toxicology*, 46(5), 1844-1850.
17. Seyfi, P., Mostafaie, A., Mansouri, K., Arshadi, D., Mohammadi-Motlagh, H.R. & Kiani, A. (2010). *In vitro* and *in vivo* anti-angiogenesis effect of shallot (*Allium ascalonicum*): A heat-stable and flavonoid-rich fraction of shallot extract potently inhibits angiogenesis. *Toxicology In Vitro*, 24(6), 1655-1661.
18. Mohammadi-Motlagh, H.R., Mostafaie, A. & Mansouri, K. (2011). Anticancer and anti-inflammatory activities of shallot (*Allium ascalonicum*) extract. *Archives of Medical Science,* 7(1), 38.
19. Sakai, Y., Murakami, T. & Yamamoto, Y. (2003). Antihypertensive effects of onion on NO synthase inhibitor-induced hypertensive rats and

spontaneously hypertensive rats. *Bioscience, Biotechnology, and Biochemistry*, 67(6), 1305-1311.
20. Naseri, M.K.G., Arabian, M., Badavi, M. & Ahangarpour, A. (2008). Vasorelaxant and hypotensive effects of *Allium cepa* peel hydroalcoholic extract in rat. *Pakistan Journal of Biological Sciences*, 11(12), 1569-1575.
21. Farag, M., Ali, S., Hodaya, R., El-Seedi, H., Sultani, H., Laub, A., Eissa, T., Abou-Zaid, F. & Wessjohann, L. (2017). Phytochemical profiles and antimicrobial activities of *Allium cepa* red cv. and *A. sativum* subjected to different drying methods: a comparative MS-based metabolomics. *Molecules*, 22(5), 761.
22. Dubey, H., Singh, A., Patole, A.M. & Tenpe, C.R. (2017). Antihypertensive effect of allicin in dexamethasone-induced hypertensive rats. *Integrative Medicine Research*, 6(1), 60-65.
23. Shouk, R., Abdou, A., Shetty, K., Sarkar, D. & Eid, A.H. (2014). Mechanisms underlying the antihypertensive effects of garlic bioactives. *Nutrition Research*, 34(2), 106-115.
24. Ahmad, F.U.D., Sattar, M.A., Rathore, H.A., Abdullah, M.H., Tan, S., Abdullah, N.A. & Johns, E.J. (2012). Exogenous hydrogen sulfide (H_2S) reduces blood pressure and prevents the progression of diabetic nephropathy in spontaneously hypertensive rats. *Renal Failure*, 34(2), 203-210.
25. Raji, N.O., Adebisi, I.M. & Bello, S.O. (2013). Ethnobotanical survey of antihypertensive agents in Sokoto, Northwest Nigeria. *International Journal of Innovative Research and Development*, 2(5), 1820-1836.
26. Tchikaya, F.O., Bantsielé, G.B., Kouakou-Siransy, G., Datté, J.Y., Datté, P.A., Zirihi, N.G. & Offoumou, M.A. (2011). *Anacardium occidentale* Linn. (Anacardiaceae) stem bark extract induces hypotensive and cardio-inhibitory effects in experimental animal models. *African Journal of Traditional, Complementary and Alternative Medicines*, 8(4), 452-461.
27. Trevisan, M.T.S., Ricarte, I., Dos Santos, S.J.M., Almeida, W.P., Ulrich, C.M. & Owen, R.W. (2018). Inhibition of angiotensin I converting enzyme by anacardic acids isolated from Cashew nut (*Anacardium occidentale* Linn.) shell liquid. *International Journal of Food Properties*, 21(1), 921-929
28. Shah, K.A., Patel, M.B., Patel, R.J. & Parmar, P.K. (2010). *Mangifera indica* (mango). *Pharmacognosy Reviews*, 4(7), 42-48.
29. Ronchi, S.N., Brasil, G.A., do Nascimento, A.M., de Lima, E.M., Scherer, R., Costa, H.B., Romão, W., Boëchat, G.A.P., Lenz, D., Fronza, M. & Bissoli, N.S. (2015). Phytochemical and *in vitro* and *in vivo* biological investigation on the antihypertensive activity of mango leaves (*Mangifera indica* L.). *Therapeutic Advances in Cardiovascular Disease*, 9(5), 244-256.
30. Yang, H., Bai, W., Gao, L., Jiang, J., Tang, Y., Niu, Y., Lin, H. & Li, L. (2018). Mangiferin alleviates hypertension induced by hyperuricemia via increasing nitric oxide releases. *Journal of Pharmacological Sciences*, 137, 154-191.
31. Ishola, I.O., Agbaje, E.O., Akinleye, M.O., Ibeh, C.O. & Adeyemi, O.O. (2014). Antidepressant-like effect of the hydroethanolic leaf extract of *Alchornea cordifolia* (Schumach. and Thonn.) Mull. Arg. (Euphorbiaceae) in mice: involvement of monoaminergic system. *Journal of Ethnopharmacology*, 158, 364-372.
32. Sameh, S., Al-Sayed, E., Labib, R.M. & Singab, A.N. (2018). Genus *Spondias*: A Phytochemical and Pharmacological Review. *Evidence-Based Complementary and Alternative Medicine*, 2018, 1-13.
33. Akinmoladun, A.C., Obuotor, E.M., Barthwal, M.K., Dikshit, M. & Farombi, E.O. (2010). Ramipril-like activity of *Spondias mombin* Linn against no-flow ischemia and isoproterenol-induced cardiotoxicity in rat heart. *Cardiovascular Toxicology*, 10(4), 295-305.
34. Adewole, S. & Ojewole, J. (2009). Protective effects of *Annona muricata* Linn. (Annonaceae) leaf aqueous extract on serum lipid profiles and oxidative stress in hepatocytes of streptozotocin-treated diabetic rats. *African Journal of Traditional, Complementary and Alternative Medicines*, 6(1), 30-41.
35. Moghadamtousi, S.Z., Fadaeinasab, M., Nikzad, S., Mohan, G., Ali, H.M. & Kadir, H.A. (2015). *Annona muricata* (Annonaceae): a review of its traditional uses, isolated acetogenins and biological activities. *International Journal of Molecular Sciences*, 16(7), 15625-15658.
36. Adefegha, S.A., Oyeleye, S.I. & Oboh, G. (2015). Distribution of phenolic contents, antidiabetic potentials, antihypertensive properties, and antioxidative effects of soursop (*Annona muricata* L.) fruit parts in vitro. *Biochemistry Research International*, 2015.
37. Olanlokun, J.O. & Akomolafe, S.F. (2013). Antioxidant potentials of various solvent extracts from stem bark of *Enantia chlorantha*. *Journal of Biomedical Science and Engineering*, 6(9), 877-884.
38. Gbolade, A. (2012). Ethnobotanical study of plants used in treating hypertension in Edo State of Nigeria. *Journal of Ethnopharmacology*, 144(1), 1-10.
39. Diallo, A., Traore, M.S., Keita, S.M., Balde, M.A., Keita, A., Camara, M., Van Miert, S., Pieters, L. & Balde, A.M. (2012). Management of diabetes in Guinean traditional medicine: an ethnobotanical investigation in the coastal lowlands. *Journal of Ethnopharmacology*, 144(2), 353-361.
40. Etoundi, O., Kuate, D., Ngondi, J. & Oben, E. (2013). Effects of extracts of *Hypodaphnis zenkiri* and *Xylopia aethiopica* on blood lipids, glycemia and body weight of roton W-1339 and insulino resistant rats. *International Journal of Research in Ayurveda Pharmacy*, 4, 736-741.
41. Somova, L.I., Shode, F.O., Moodley, K. & Govender, Y. (2001). Cardiovascular and diuretic activity of kaurene derivatives of *Xylopia aethiopica* and

Alepidea amatymbica. *Journal of Ethnopharmacology*, 77(2-3), 165-174.
42. Adefegha, S.A., Oboh, G., Olasehinde, T.A. & Boligon, A.A. (2018). Dietary supplementation with Ethiopian pepper (*Xylopia aethiopica*) modulates angiotensin-I converting enzyme activity, antioxidant status and extenuates hypercholesterolemia in high cholesterol fed Wistar rats. *PharmaNutrition*, 6(1), 9-16.
43. Mossa, J.S., Tariq, M., Mohsin, A., Ageel, A.M., Al-Yahya, M.A., Al-Said, M.S. & Rafatullah, S. (1991). Pharmacological studies on aerial parts of *Calotropis procera*. *The American Journal of Chinese Medicine*, 19(03n04), 223-231.
44. Juncker, T., Schumacher, M., Dicato, M. & Diederich, M. (2009). UNBS1450 from *Calotropis procera* as a regulator of signaling pathways involved in proliferation and cell death. *Biochemical Pharmacology*, 78(1), 1-10.
45. Moustafa, A.M.Y., Ahmed, S.H., Nabil, Z.I., Hussein, A.A. & Omran, M.A. (2010). Extraction and phytochemical investigation of *Calotropis procera*: effect of plant extracts on the activity of diverse muscles. *Pharmaceutical Biology*, 48(10), 1080-1190.
46. Aslam, J., Khan, S.H., Siddiqui, Z.H., Fatima, Z., Maqsood, M., Bhat, M.A., Nasim, S.A., Ilah, A., Ahmad, I.Z., Khan, S.A. & Mujib, A. (2010). *Catharanthus roseus* (L.) G. Don. an important drug: it's applications and production. *Pharmacie Globale (IJCP)*, 4(12), 1-16.
47. Rinayanti, A., Radji, M., Mun'im, A. & Suyatna, F.D. (2013). Screening angiotensin converting enzyme (ACE) inhibitor activity of antihypertensive medicinal plants from Indonesia. *International Journal of Pharmacy Teaching and Practices*, 4, 527-32.
48. Almagro, L., Fernández-Pérez, F. & Pedreño, M.A. (2015). Indole alkaloids from *Catharanthus roseus*: bioproduction and their effect on human health. *Molecules*, 20(2), 2973-3000.
49. Adeneye, A.A., Adeyemi, O.O. & Agbaje, E.O. (2010). Anti-obesity and antihyperlipidaemic effect of *Hunteria umbellata* seed extract in experimental hyperlipidaemia. *Journal of Ethnopharmacology*, 130(2), 307-314.
50. Ajiboye, T.O., Hussaini, A.A., Nafiu, B.Y. & Ibitoye, O.B. (2017). Aqueous seed extract of *Hunteria umbellata* (K. Schum.) Hallier (Apocynaceae) palliates hyperglycemia, insulin resistance, dyslipidemia, inflammation and oxidative stress in high-fructose diet-induced metabolic syndrome in rats. *Journal of Ethnopharmacology*, 198, 184-193.
51. Oboh, G., Adebayo, A.A. & Ademosun, A.O. (2019). *Hunteria umbellata* seed extract administration modulates activities of phosphodiesterase-5 and purinergic enzymes relevant to erection in normal male rats. *Oriental Pharmacy and Experimental Medicine*, 19(2), 167-75.
52. Lobay, D. (2015). Rauwolfia in the treatment of hypertension. *Integrative Medicine: A Clinician's Journal*, 14(3), 40.
53. Kaur, A. (2018). Pharmacobotanical and pharmacological evaluation of ayurvedic crude drug: Rauwolfia serpentina (Apocynaceae). *International Journal of Green Pharmacy*, 11(04).
54. Tan, P.V. & Nyasse, B. (2000). Anti-ulcer compound from *Voacanga africana* with possible histamine H2 receptor blocking activity. *Phytomedicine*, 7(6), 509-515.
55. Kim, Y., Jung, H.J. & Kwon, H.J. (2012). A natural small molecule voacangine inhibits angiogenesis both *in vitro* and *in vivo*. *Biochemical and Biophysical Research Communications*, 417(1), 330-334.
56. Niu, Y., Yang, C., Zhou, J., Huang, S. & Liu, J. (2016). Two new compounds with antimicrobial activities from the seeds of *Voacanga africana*. *Phytochemistry Letters*, *18*, 208-212.
57. Nishanthini, A. & Mohan, V.R. (2012). Antioxidant activities of *Xanthosoma sagittifolium* Schott using various in vitro assay models. *Asian Pacific Journal of Tropical Biomedicine*, 2(3), S1701-S1706.
58. de Almeida Jackix, E., Monteiro, E.B., Raposo, H.F. & Amaya-Farfán, J. (2013). Cholesterol reducing and bile-acid binding properties of taioba (*Xanthosoma sagittifolium*) leaf in rats fed a high-fat diet. *Food Research International*, 51(2), 886-891.
59. Carole, D.A., Désiré, M.H. & Denis, O.N. (2018). Effect of arbuscular mycorrhizal fungi on the dynamics of hydrogen peroxide, the activities of catalase, ascorbate peroxidase and Guaïcol peroxidase in Xanthosoma sagittifolium L. Schott rhizome and root during growth. *Journal of Biodiversity and Environmental Sciences*, 12(5), 1-15.
60. Lima, E.B.C., Sousa, C.N.S., Meneses, L.N., Ximenes, N.C., Júnior, S., Vasconcelos, G.S., Lima, N.B.C., Patrocínio, M.C.A., Macedo, D. & Vasconcelos, S.M.M. (2015). *Cocos nucifera* (L.) (Arecaceae): A phytochemical and pharmacological review. *Brazilian Journal of Medical and Biological Research*, 48(11), 953-964.
61. Dawodu, A.O., Ojokuku, S.A. & Osifeso, T.A. (2011). The effects of oral administration of anti-pile decoction on haematology and some metabolic parameters of albino rats. International Journal of Science and Society Yabatech, 1(1), 24-28.
62. Akah, P.A., Uzodinma, S.U. & Okolo, C.E. (2011). Antidiabetic activity of aqueous and methanol extract and fractions of *Gongronema latifolium* (Asclepidaceae) leaves in alloxan diabetic rats. *Journal of Applied Pharmaceutical Science*, 1(9), 99-102.
63. Ajibola, C.F., Eleyinmi, A.F. & Aluko, R.E. (2011). Kinetics of the inhibition of renin and angiotensin I converting enzyme by polar and non-polar polyphenolic extracts of *Vernonia amygdalina* and *Gongronema latifolium* leaves. *Plant Foods for Human Nutrition*, 66(4), 320-327.
64. Aliero, A.A. & Wara, S.H. (2009). Validating the medicinal potential of *Leptadenia hastata*. *African Journal of Pharmacy and Pharmacology*, 3(6), 235-238.

65. Thomas, S.D. (2012). *Leptadenia hastata*: A Review of its traditional uses and its pharmacological activity. *Medicinal Chemistry*, 2(7), 148-150.
66. Imaga, N.O.A., Gbenle, G.O., Okochi, V.I., Adenekan, S.O., Edeoghon, S.O., Kehinde, M.O., Bamiro, S.B., Ajiboye, A. & Obinna, A. (2010). Antisickling and toxicological profiles of leaf and stem of *Parquetina nigrescens* L. *Journal of Medicinal Plants Research*, 4(8), 639-643.
67. Kayode, O.T. & Yakubu, M.T. (2017). *Parquetina nigrescens* leaves: chemical profile and influence on the physical and biochemical indices of sexual activity of male Wistar rats. *Journal of Integrative Medicine*, 15(1), 64-76.
68. Oyagbemi, A.A., Omobowale, T.O., Ochigbo, G.O., Asenuga, E.R., Ola-Davies, O.E., Ajibade, T.O., Saba, A.B. & Adedapo, A.A. (2018). Polyphenol-rich fraction of *Parquetina nigrescens* mitigates dichlorvos-induced cardiorenal dysfunction through reduction in cardiac nitrotyrosine and renal p38 expressions in wistar rats. *Journal of Dietary Supplements*, 15(3), 269-284.
69. Metowogo, K., Agbonon, A., Eklu-Gadegbeku, K., Aklikokou, A.K. & Gbeassor, M. (2008). Antiulcer and antiinflammatory effects of hydroalcohol extract of *Aloe buettneri* A. Berger (Lilliaceae). *Tropical Journal of Pharmaceutical Research*, 7(1), 907-912.
70. Metowogo, K., Eklu-Gadegbeku, K., Agbonon, A., Aklikokou, K.A. & Gbeassor, M. (2011). Gastroprotective effect of hydroalcoholic extract of *Aloe buettneri*. *Iranian Journal of Pharmaceutical Research*, 10(1), 69-74.
71. Arunkumar, S. & Muthuselvam, M. (2009). Analysis of phytochemical constituents and antimicrobial activities of *Aloe vera* L. against clinical pathogens. *World Journal of Agricultural Sciences*, 5(5), 572-576.
72. Jain, N., Vijayaraghavan, R., Pant, S.C., Lomash, V. & Ali, M. (2010). *Aloe vera* gel alleviates cardiotoxicity in streptozocin-induced diabetes in rats. *Journal of Pharmacy and Pharmacology*, 62(1), 115-123.
73. Kouchmeshky, A., Jameie, S.B., Amin, G. & Ziai, S.A. (2012). Investigation of angiotensin-convertings enzyme inhibitory effects of medicinal plants used in traditional Persian medicine for treatment of hypertension: screening study. *Thrita Student Journal of Medical Scienses*, 1(1), 13-23.
74. Pothuraju, R., Sharma, R.K., Onteru, S.K., Singh, S. & Hussain, S.A. (2016). Hypoglycemic and hypolipidemic effects of *Aloe vera* extract preparations: A review. *Phytotherapy Research*, 30(2), 200-207.
75. Eskander, J., Lavaud, C. & Harakat, D. (2011). Steroidal saponins from the leaves of *Beaucarnea recurvata*. *Phytochemistry*, 72(9), 946-951.
76. Olorunnisola, O.S., Adetutu, A. & Afolayan, A.J. (2015). An inventory of plants commonly used in the treatment of some disease conditions in Ogbomoso, South West, Nigeria. *Journal of Ethnopharmacology*, 161, 60-68.
77. Noumedem, J.A., Mihasan, M., Lacmata, S.T., Stefan, M., Kuiate, J.R. & Kuete, V. (2013). Antibacterial activities of the methanol extracts of ten Cameroonian vegetables against gram-negative multidrug-resistant bacteria. *BMC Complementary and Alternative Medicine*, 13(1), 26.
78. Mohammed, S., Danjuma, M.N. & Abdulkarim, I.A. (2015). Ethnobotanical survey of medicinal plants in metropolitan Kano, Nigeria. *International Journal of Public Health Research*, 3(6), 345-351.
79. Lienou, L.L., Telefo, B.P., Bale, B., Yemele, D., Tagne, R.S., Goka, S.C., Lemfack, C.M., Mouokeu, C. & Moundipa, P.F. (2012). Effect of the aqueous extract of *Senecio biafrae* (Oliv. and Hiern) J. Moore on sexual maturation of immature female rat. *BMC Complementary and Alternative Medicine*, 12(1), 36.
80. Johnson, O.O., Adeyemi, D.K., Adeusi, O. & Ayoola, G.A. (2017). Evaluation of the phytochemical constituents and antioxidant activity of the stem of *Senecio biafrae* (Asteraceae). *Nigerian Journal of Pharmaceutical and Applied Science Research*, 6(2), 19-23.
81. Okoro, O.I. & Kadiri, E.H. (2019). Antioxidant and hepatoprotective effects of *Senecio biafrae* on CCl4-induced liver damage in rats. *Iranian Journal of Toxicology*, 13(2), 31-35.
82. Nazeruddin, G.M., Shirish, S.P. & Samir, S.S. (2011). Pharmacological review of *Tridax procumbens* L. *Der Pharmacia Sinica*, 2(4), 172-175.
83. Salahdeen, H.M., Idowu, G.O., Salami, S.A., Murtala, B.A. & Alada, A.A. (2016). Mechanism of vasorelaxation induced by *Tridax procumbens* extract in rat thoracic aorta. *Journal of Intercultural Ethnopharmacology*, 5(2), 174-179.
84. Adaramoye, O.A., Akintayo, O., Achem, J. & Fafunso, M.A. (2008). Lipid-lowering effects of methanolic extract of *Vernonia amygdalina* leaves in rats fed on high cholesterol diet. *Vascular Health and Risk Management*, 4(1), 235-241.
85. Ijeh, I.I. & Ejike, C.E. (2011). Current perspectives on the medicinal potentials of *Vernonia amygdalina* Del. *Journal of Medicinal Plants Research*, 5(7), 1051-1061.
86. Saliu, J.A., Ademiluyi, A.O., Akinyemi, A.J. & Oboh, G. (2012). *In vitro* antidiabetic and antihypertension properties of phenolic extracts from bitter leaf (*Vernonia amygdalina* Del.). *Journal of Food Biochemistry*, 36(5), 569-576.
87. Ch'ng, Y.S., Loh, Y.C., Tan, C.S., Ahmad, M., Asmawi, M.Z., Wan Omar, W.M. & Yam, M.F. (2017). Vasorelaxant properties of *Vernonia amygdalina* ethanol extract and its possible mechanism. *Pharmaceutical Biology*, 55(1), 2083-2094.
88. Owolabi, O.J. & Omogbai, E.K. (2007). Analgesic and anti-inflammatory activities of the ethanolic stem bark extract of *Kigelia africana* (Bignoniaceae). *African Journal of Biotechnology*, 6(5), 582-585.
89. Gabriel, O.A. & Olubunmi, A. (2009). Comprehensive scientific demystification of *Kigelia*

africana: A review. *African Journal of Pure and Applied Chemistry*, 3(9), 158-164.
90. Saini, S., Kaur, H., Verma, B. & Singh, S.K. (2009). *Kigelia africana* (Lam.) Benth. —an overview. *Natural Product Radiance*, 8(2), 190-197.
91. Enye, J.C., Onubueze, D.P.M., Chineke, H.N. & Nweke, I. (2013). The antihypertensive property of methanolic extract of *Newbouldia laevis* on anaesthesized cats. *Journal of Dental and Medical sciences*, 8, 35-39.
92. Osigwe, C.C., Akah, P.A. & Nworu, C.S. (2017). Biochemical and haematological effects of the leaf extract of *Newbouldia laevis* in alloxan-induced diabetic rats. *Journal of Biosciences and Medicines*, 5(6), 18.
93. Adelaja, A. A., Ayoola, M. D., Otulana, J. O., Akinola, O. B., Olayiwola, A. & Ejiwunmi, A. B. (2008). Evaluation of the histo-gastroprotective and antimicrobial activities of *Heliotropium indicum* linn (Boraginaceae). *The Malaysian Journal of Medical Sciences,* 15(3), 22–30.
94. Kyei, S., Koffuor, G.A., Ramkissoon, P. & Owusu-Afriyie, O. (2015). Anti-glaucoma potential of *Heliotropium indicum* Linn in experimentally-induced glaucoma. *Eye and Vision*, 2(1), 16.
95. Anand, P., Murali, Y.K., Tandon, V., Murthy, P.S. & Chandra, R. (2009). Insulinotropic effect of aqueous extract of *Brassica nigra* improves glucose homeostasis in streptozotocin induced diabetic rats. *Experimental and Clinical Endocrinology and Diabetes*, 117(06), 251-256.
96. Hussein, E.A., Taj-Eldeen, A.M., Al-Zubairi, A.S., Elhakimi, A.S. & Al-Dubaie, A.R. (2010). Phytochemical screening, total phenolics and antioxidant and antibacterial activities of callus from *Brassica nigra* L. hypocotyl explants. *International Journal of Pharmacology*, 6(4), 464-471.
97. Alam, M.B., Hossain, M.S. & Haque, M.E. (2011). Antioxidant and anti-inflammatory activities of the leaf extract of Brassica nigra. *International Journal of Pharmaceutical Sciences and Research*, 2(2), 303-310.
98. Taussig, S.J. & Batkin, S. (1988). Bromelain, the enzyme complex of pineapple (*Ananas comosus*) and its clinical application. An update. *Journal of Ethnopharmacology*, 22(2), 191-203.
99. Adamab, Y., Nasaruddinc, A.A., Zurainia, A., Arifahd, A.K., Zakariaa, M.O.F.Z. & Somchitaf, M.N. (2013). Diuretic activity of roots from *Carica papaya* L. and *Ananas comosus* L. *International Journal of Pharmaceutical Sciences Review and Research* 23(1), 163-167.
100. Ahmed, M.M. (2016). Pineapple juice ameliorates the high fat diet-induced alterations in cardiac gene expression pattern in male rats. *International Journal of Biochemistry Research and Review*, 1-11.
101. Musa, A.A. (2008). Antioxidant and antibacterial activity of. *Research Journal of Phytochemistry*, 2(2), 106-111.
102. Ibrahim, T., Gidado, G., Muluh, K. & Alexander, A. (2016). Phytochemical screening, antioxidant and antibacterial activities of *Commiphora kerstingii*. *International Biological and Biomedical Journal*, 2(3), 127-133.
103. Ogboru, R.O., Okolie, P.L. & Agboje, I. (2015). Phytochemical screening and medicinal potentials of the bark of *Dacryodes edulis* (G Don) HJ Lam. *Journal of Environmental and Analytical Chemistry*, 2(158), 2380-2391.
104. Erukainure, O.L., Mopuri, R., Oyebode, O.A., Koorbanally, N.A. & Islam, M.S. (2017). *Dacryodes edulis* enhances antioxidant activities, suppresses DNA fragmentation in oxidative pancreatic and hepatic injuries; and inhibits carbohydrate digestive enzymes linked to type 2 diabetes. *Biomedicine and Pharmacotherapy*, 96, 37-47.
105. Krishna, K.L., Paridhavi, M. & Patel, J.A. (2008). Review on nutritional, medicinal and pharmacological properties of Papaya (*Carica papaya* Linn.). *Natural Product Radiance*, 7(4), 364-373.
106. Hasimun, P. & Ernasari, G.I. (2014). Analgetic activity of papaya (*Carica papaya* L.) leaves extract. *Procedia Chemistry*, 13, 147-149.
107. Ikram, E.H.K., Stanley, R., Netzel, M. & Fanning, K. (2015). Phytochemicals of papaya and its traditional health and culinary uses–a review. *Journal of Food Composition and Analysis*, 41, 201-211.
108. Brasil, G.A., Ronchi, S.N., Do Nascimento, A.M., de Lima, E.M., Romão, W., Da Costa, H.B., Scherer, R., Ventura, J.A., Lenz, D., Bissoli, N.S. & Endringer, D.C. (2014). Antihypertensive effect of *Carica papaya* via a reduction in ACE activity and improved baroreflex. *Planta Medica*, 80(17), 1580-1587.
109. Peni, I.J., Elinge, C.M., Yusuf, H., Itodo, A.U., Agaie, B.M., Mbongo, A.N. & Chogo, E. (2010). Phytochemical screening and antibacterial activity of *Parinari curatellifolia* stem extract. *Journal of Medicinal Plants Research*, 4(20), 2099-2102.
110. Adaramoye, O.A. & Medeiros, I.A. (2009). Endothelium-independent vasodilation induced by kolaviron, a biflavonoid complex from *Garcinia kola* seeds, in rat superior mesenteric arteries. *Journal of Smooth Muscle Research*, 45(1), 39-53.
111. Adaramoye, O.A., Nwosu, I.O. & Farombi, E.O. (2012). Sub-acute effect of NG-nitro-l-arginine methyl-ester (L-NAME) on biochemical indices in rats: protective effects of Kolaviron and extract of *Curcuma longa* L. *Pharmacognosy Research*, 4(3), 127-133
112. Oyagbemi, A.A., Omobowale, T.O., Asenuga, E.R., Abiola, I.O., Adedapo, A.A. & Yakubu, M.A. (2018). Kolaviron attenuated arsenic acid induced-cardiorenal dysfunction via regulation of ROS, C-reactive proteins (CRP), cardiac troponin I (CTnI) and BCL2. *Journal of Traditional and Complementary Medicine*, 8(3), 396-409.
113. Khan, H., Ali Khan, M. & Hussan, I. (2007). Enzyme inhibition activities of the extracts from rhizomes of *Gloriosa superba* Linn (Colchicaceae). *Journal of Enzyme Inhibition and Medicinal Chemistry*, 22(6), 722-725.

114. Jana, S. & Shekhawat, G.S. (2011). Critical review on medicinally potent plant species: *Gloriosa superba*. *Fitoterapia*, 82(3), 293-301.
115. Okwuosa, C., Unekwe, P., Nwobodo, E. & Chilaka, K. (2006). The anti-ulcer activities of leaf extracts of *Combretum racemosum* (Family: combracaceae). *Journal of Biomedical Investigation*, 4(1), 9-14.
116. Manga, F.N., El Khattabi, C., Fontaine, J., Berkenboom, G., Duez, P., Nzunzu, J.L. & Pochet, S. (2012). Vascular effects and antioxidant activity of two Combretum species from Democratic Republic of Congo. *Journal of Ethnopharmacology*, 142(1), 194-200.
117. Schepetkin, I.A., Kouakou, K., Yapi, A., Kirpotina, L.N., Jutila, M.A. & Quinn, M.T. (2013). Immunomodulatory and hemagglutinating activities of acidic polysaccharides isolated from *Combretum racemosum*. *International Immunopharmacology*, 15(3), 628-637.
118. Ojewole, J.A. (2005). Antinociceptive, anti-inflammatory and antidiabetic effects of *Bryophyllum pinnatum* (Crassulaceae) leaf aqueous extract. *Journal of Ethnopharmacology*, 99(1), 13-19.
119. Afzal, M., Kazmi, I., Khan, R., Singh, R., Chauhan, M., Bisht, T. & Anwar, F. (2012). *Bryophyllum pinnatum*: a review. *International Journal of Research in Biological Sciences*, 2(4), 143-149.
120. Chibli, L.A., Rodrigues, K.C., Gasparetto, C.M., Pinto, N.C., Fabri, R.L., Scio, E., Alves, M.S., Del-Vechio-Vieira, G. & Sousa, O.V. (2014). Anti-inflammatory effects of *Bryophyllum pinnatum* (Lam.) Oken ethanol extract in acute and chronic cutaneous inflammation. *Journal of Ethnopharmacology*, 154(2), 330-338.
121. Grover, J.K. & Yadav, S.P. (2004). Pharmacological actions and potential uses of Momordica charantia: a review. *Journal of Ethnopharmacology*, 93(1), 123-132.
122. Tan, H.F. & Gan, C.Y. (2016). Polysaccharide with antioxidant, α-amylase inhibitory and ACE inhibitory activities from *Momordica charantia*. *International Journal of Biological Macromolecules*, 85, 487-496.
123. Shodehinde, S.A., Adefegha, S.A., Oboh, G., Oyeleye, S.I., Olasehinde, T.A., Nwanna, E.E., Adedayo, B.C. & Boligon, A.A. (2016). Phenolic composition and evaluation of methanol and aqueous extracts of bitter gourd (*Momordica charantia* L) leaves on angiotensin-I-converting enzyme and some pro-oxidant-induced lipid peroxidation in vitro. *Journal of Evidence-Based Complementary and Alternative Medicine*, 21(4), NP67-NP76.
124. Weniger, B., Lagnika, L., Vonthron-Senecheau, C., Adjobimey, T., Gbenou, J., Moudachirou, M., Brun, R., Anton, R. & Sanni, A. (2004). Evaluation of ethnobotanically selected Benin medicinal plants for their *in vitro* antiplasmodial activity. *Journal of Ethnopharmacology*, 90(2-3), 279-284.
125. Lagnika, L., Anago, E. & Sanni, A. (2011). Screening for antibacterial, antioxidant activity and toxicity of some medicinal plants used in Benin folkloric medicine. *Journal of Medicinal Plants Research*, 5(5), 773-777.
126. Adeniyi, B.A., Odelola, H.A. & Oso, B.A. (1996). Antimicrobial potentials of *Diospyros mespiliformis* (Ebenaceae). *African Journal of Medicine and Medical Sciences*, 25(3), 221-224.
127. Shagal, M.H., Kubmarawa, D. & Alim, H. (2012). Preliminary phytochemical investigation and antimicrobial evaluation of roots, stem-bark and leaves extracts of *Diospyros mespiliformis*. *International Research Journal of Biochemistry and Bioinformatics*, 2(1), 11-15.
128. Rauf, A., Uddin, G., Patel, S., Khan, A., Halim, S.A., Bawazeer, S., Ahmad, K., Muhammad, N. & Mubarak, M.S. (2017). Diospyros, an under-utilized, multi-purpose plant genus: A review. *Biomedicine and Pharmacotherapy*, 91, 714-730.
129. Akinyemi, A.J., Ademiluyi, A.O. & Oboh, G. (2014). Inhibition of angiotensin-1-converting enzyme activity by two varieties of ginger (*Zingiber officinale*) in rats fed a high cholesterol diet. *Journal of Medicinal Food*, 17(3), 317-323.
130. Ikewuchi, J.C., Onyeike, E.N., Uwakwe, A.A. & Ikewuchi, C.C. (2011). Effect of aqueous extract of the leaves of *Acalypha wilkesiana* 'Godseffiana'Muell Arg on blood pressure components and pulse rates of sub chronic salt-loaded rats. *Research Journal of Science and Technology*, 3(5), 264-269.
131. Ogungbamila, F.O. & Samuelsson, G. (1990). Smooth muscle relaxing flavonoids from *Alchornea cordifolia*. *Acta Pharmaceutica Nordica*, 2(6), 421-422.
132. Boniface, P.K., Ferreira, S.B. & Kaiser, C.R. (2016). Recent trends in phytochemistry, ethnobotany and pharmacological significance of *Alchornea cordifolia* (Schumach. and Thonn.) Muell. Arg. *Journal of Ethnopharmacology*, 191, 216-244.
133. Williams, L.A., Gossell-Williams, M., Sajabi, A., Barton, E.N. & Fleischhacker, R. (1997). Angiotensin converting enzyme inhibiting and anti-dipsogenic activities of *Euphorbia hirta* extracts. *Phytotherapy Research: An International Journal Devoted to Medical and Scientific Research on Plants and Plant Products*, 11(5), 401-402.
134. Johnson, P.B., Abdurahman, E.M., Tiam, E.A., Abdu-Aguye, I. & Hussaini, I.M. (1999). *Euphorbia hirta* leaf extracts increase urine output and electrolytes in rats. *Journal of Ethnopharmacology*, 65(1), 63-69.
135. Huang, L., Chen, S. & Yang, M. (2012). *Euphorbia hirta* (Feiyangcao): A review on its ethnopharmacology, phytochemistry and pharmacology. *Journal of Medicinal Plants Research*, *6*(39): 5176-5185.
136. Srividya, N.A. & Periwal, S. (1995). Diuretic, hypotensive and hypoglycaemic effect of *Phyllanthus amarus*. *Indian Journal of Experimental Biology*, 33(11), 861-864.
137. Adegoke, A.A., Iberi, P.A., Akinpelu, D.A., Aiyegoro, O.A. & Mboto, C.I. (2010). Studies on

phytochemical screening and antimicrobial potentials of *Phyllanthus amarus* against multiple antibiotic resistant bacteria. *International Journal of Applied Research in Natural Products*, 3(3), 6-12.

138. Patel, J.R., Tripathi, P., Sharma, V., Chauhan, N.S. & Dixit, V.K. (2011). *Phyllanthus amarus*: Ethnomedicinal uses, phytochemistry and pharmacology: a review. *Journal of Ethnopharmacology*, 138(2), 286-313.
139. Divya, K., Ankur, R., Seema, R. & Khan, M.U. (2011). *Phyllanthus amarus*: An ample therapeutic potential herb. *International Journal of Research in Ayurveda and Pharmacy*, 2(4), 1096-1099.
140. Jena, J. & Gupta, A.K. (2012). *Ricinus communis* Linn: a phytopharmacological review. *International Journal of Pharmacy and Pharmaceutical Sciences*, 4(4), 25-29.
141. Rana, M., Dhamija, H., Prashar, B. & Sharma, S. (2012). *Ricinus communis* L.—a review. *International Journal of PharmTech Research*, 4(4), 1706-1711.
142. Paul, E.D., Sangodare, R.S. & Agbaji, A.S. (2013). Chemical analysis of leaves of *Abrus precatorius*. *International Journal of Plant Physiology and Biochemistry*, 5(5), 65-67.
143. Okhale, S.E. & Nwanosike, E.M. (2016). *Abrus precatorius* Linn (Fabaceae): phytochemistry, ethnomedicinal uses, ethnopharmacology and pharmacological activities. *International Journal of Pharmaceutical Sciences and Research*, 1, 37-43.
144. Gayaraja, S., Shinde, S. & Agrawal, S.L. (1977). Phytochemical and pharmacological study of *Caesalpinia bonduc*. *Indian Journal of Pharmacology*, 9, 75.
145. Mandade, R.J. (2011). Hepatoprotective activity of ethanolic extract of *Caesalpinia bonduc* (L.) in paracetamol intoxicated albino rats. *International Journal of PharmTech Research*, 3, 430-437.
146. Konan, A.B., Bléyéré, M.N., Amonkan, A.K., Bouafou, M.K. & Datté, J.Y. (2014). Why African traditional birth attendants used *Ceasalpinia bonduc* leaves to facilitate childbirth in parturient women. *International Journal of Pharmacy Review and Research [Internet]*, 4(1), 11-16.
147. Wu, N., Fu, K., Fu, Y.J., Zu, Y.G., Chang, F.R., Chen, Y.H., Liu, X.L., Kong, Y., Liu, W. & Gu, C.B. (2009). Antioxidant activities of extracts and main components of pigeon pea [*Cajanus cajan* (L.) Millsp.] leaves. *Molecules*, 14(3), 1032-1043.
148. Zhang, D.M., Li, Y., San Cheang, W., Lau, C.W., Lin, S.M., Zhang, Q.L., Yao, N., Wang, Y., Wu, X., Huang, Y. & Ye, W.C. (2012). Cajaninstilbene acid relaxes rat renal arteries: roles of $Ca2^{+}$ antagonism and protein kinase C-dependent mechanism. *PloS One*, 7(10), p.e47030.
149. Lee, B.H., Lai, Y.S. & Wu, S.C. (2015). Antioxidation, angiotensin converting enzyme inhibition activity, nattokinase, and antihypertension of Bacillus subtilis (natto)-fermented pigeon pea. *Journal of Food and Drug Analysis*, 23(4), 750-757.
150. Kamanyi, A., Dongmo, A.B., Salah, M.A., Jatsa, H., Wagner, H., Vierling, W. & Bopelet, M. (2003). Endothelium mediated aortic relaxation and blood pressure lowering effect of a procyanidin rich fraction of the stembark extracts of *Erythrophleum suaveolens*. *Pharmaceutical Biology*, 41(1), 62-67.
151. Aiyegoro, O.A., Akinpelu, D.A. & Okoh, A.I. (2007). *In vitro* antibacterial potentials of the stem bark of red water tree (*Erythrophleum suaveolens*). *Journal of Biological Sciences*, 7(7), 1233-1238.
152. Mesa, M.D., Silván, J.M., Olza, J., Gil, Á. & del Castillo, M.D. (2008). Antioxidant properties of soy protein–fructooligosaccharide glycation systems and its hydrolysates. *Food Research International*, 41(6), 606-615.
153. Correa, C.R., Li, L., Aldini, G., Carini, M., Chen, C.Y.O., Chun, H.K., Cho, S.M., Park, K.M., Russell, R.M., Blumberg, J.B. & Yeum, K.J. (2010). Composition and stability of phytochemicals in five varieties of black soybeans (*Glycine max*). *Food Chemistry*, 123(4), 1176-1184.
154. Ademiluyi, A.O. & Oboh, G. (2013). Soybean phenolic-rich extracts inhibit key-enzymes linked to type 2 diabetes (α-amylase and α-glucosidase) and hypertension (angiotensin I converting enzyme) *in vitro*. *Experimental and Toxicologic Pathology*, 65(3), 305-309.
155. Azam, S., Huda, A.F., Shams, K., Ansari, P., Mohamed, M.K., Hasan, M.M., Azad, A.K., Mondal, K.K. & Zaouad, S.M. (2015). Anti-inflammatory and anti-oxidant study of ethanolic extract of *Mimosa pudica*. *Journal of Young Pharmacists*, 7(3), 234-240.
156. Kalabharathi, H.L., Shruthi, S.L., Vaibhavi, P.S., Pushpa, V.H. & Satish, A.M. (2015). Diuretic activity of ethanolic root extract of *Mimosa pudica* in albino rats. *Journal of Clinical and Diagnostic Research: JCDR*, 9(12), FF05-FF07.
157. Siddhuraju, P. & Becker, K. (2001). Rapid reversed-phase high performance of L-dopa (l-3, 4-dihydroxyphenylalanine), non-methylated and methylated tetrahydro-isoquinoline compounds from *Mucuna* beans. *Food Chemistry*, 72, 389-394.
158. Chalé, F.G.H., Ruiz, J.C.R., Fernández, J.J.A., Ancona, D.A.B. & Campos, M.R.S. (2014). ACE inhibitory, hypotensive and antioxidant peptide fractions from *Mucuna pruriens* proteins. *Process Biochemistry*, 49(10), 1691-1698.
159. Chaudhary, S.K., De, A., Bhadra, S. & Mukherjee, P.K. (2015). Angiotensin-converting enzyme (ACE) inhibitory potential of standardized *Mucuna pruriens* seed extract. *Pharmaceutical Biology*, 53(11), 1614-1620.
160. Komolafe, K., Akinmoladun, A.C. and & Olaleye, T.M. (2013). Methanolic leaf extract of *Parkia biglobosa* protects against doxorubicin-induced cardiotoxicity in rats. *International Journal of Applied Research in Natural Products*, 6(3), 39-47.
161. Tokoudagba, J.M., Auger, C., Bréant, L., N'Gom, S., Chabert, P., Idris-Khodja, N., Gbaguidi, F., Gbenou, J., Moudachirou, M., Lobstein, A. & Schini-Kerth, V.B. (2010). Procyanidin-rich fractions from *Parkia biglobosa* (Mimosaceae) leaves cause redox-

sensitive endothelium-dependent relaxation involving NO and EDHF in porcine coronary artery. *Journal of Ethnopharmacology*, 132(1), 246-250.

162. Olaleye, T.M., Komolafe, K. & Akindahunsi, A.A. (2013). Effect of methanolic leaf extract of *Parkia biglobosa* on some biochemical indices and hemodynamic parameters in rats. *Journal of Chemical and Pharmaceutical Research*, 5(1), 213-220.
163. Atawodi, S.E. & Ogunbusola, F. (2009). Evaluation of anti-trypanosomal properties of four extracts of leaves, stem and root barks of *Prosopis africana* in laboratory animals. *Biokemistri*, 21(2).
164. Ayanwuyi, L.O., Yaro, A.H. & Abodunde, O.M. (2010). Analgesic and anti-inflammatory effects of the methanol stem bark extract of *Prosopis africana. Pharmaceutical Biology*, 48(3), 296-299.
165. Ajagbonna, O.P., Mojiminiyi, F.B.O. & Sofola, O.A. (2001). Relaxant effects of the aqueous leaf extract of *Cassia occidentailis* on rat aortic rings. *African Journal of Biomedical Research*, 4(3), 127-129.
166. Vijayalakshmi, S., Ranjitha, J., Devi Rajeswari, V. & Bhagiyalakshmi, M. (2013). Pharmacological profile of *Cassia occidentalis*–a review. *International Journal of Pharmacy and Pharmaceutical Sciences*, 5, 29-33.
167. Yin, M.H., Kang, D.G., Choi, D.H., Kwon, T.O. & Lee, H.S. (2005). Screening of vasorelaxant activity of some medicinal plants used in Oriental medicines. *Journal of Ethnopharmacology*, 99(1), 113-117.
168. Hyun, S.K., Lee, H., Kang, S.S., Chung, H.Y. & Choi, J.S. (2009). Inhibitory activities of *Cassia tora* and its anthraquinone constituents on angiotensin-converting enzyme. *Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives*, 23(2), 178-184.
169. Fatokun, F.K. (2010). *Investigation of the possible anti-diabetic activity of Icacina trichantha, Ananas cosmos and Uraria picta in a rat model* (Doctoral dissertation).
170. Saxena, H.O., Soni, A., Mohammad, N. & Choubey, S.K. (2014). Phytochemical screening and elemental analysis in different plant parts of *Uraria picta* Desv.: A Dashmul species. *Journal of Chemical and Pharmaceutical Research*, 6(5), 756-760.
171. Fayed, S.A. (2009). Antioxidant and anticancer activities of *Citrus reticulate* (*Petitgrain Mandarin*) and *Pelargonium graveolens* (Geranium) essential oils. *Research Journal of Agriculture and Biological Sciences*, 5(5), 740-747.
172. Malik, T., Singh, P., Pant, S., Chauhan, N. & Lohani, H. (2011). Potentiation of antimicrobial activity of ciprofloxacin by *Pelargonium graveolens* essential oil against selected uropathogens. *Phytotherapy Research*, 25(8), 1225-1228.
173. Boukhris, M., Bouaziz, M., Feki, I., Jemai, H., El Feki, A. & Sayadi, S. (2012). Hypoglycemic and antioxidant effects of leaf essential oil of Pelargonium *graveolens* L'Hér. in alloxan induced diabetic rats. *Lipids in Health and Disease*, 11(1), 81-91.
174. Iweala, E.E. (2009). Preliminary qualitative screening for cancer chemopreventive agents in *Telfairia occidentalis* Hook. f., *Gnetum africanum* Welw., *Gongronema latifolium* Benth. and *Ocimum gratissimum* L. from Nigeria. *Journal of Medicinal Food Plants*, 1(2), 58-63.
175. Okerulu, I.O. & Onyema, C.T. (2015). Comparative assessment of phytochemicals, proximate and elemental composition of *Gnetum africanum* (Okazi) Leaves. *American Journal of Analytical Chemistry*, 6(7), 604-609
176. Ilodibia, C.V., Ugwu, R.U., Nwokolo, O.L., Chukwuma, M.U. & Akachukwu, E.E. (2015). Phytochemical screening, antifungal and antibacterial activity of aqueous and ethanolic leaf and stem extracts of *Gnetum africanum* Welw. *Research Journal of Medicinal Plants*, 9(6), 275-283.
177. Ngbolua, K.T.N., T Mpiana, P., B Akoundze, J., B Mwanza, F., ST Tshibangu, D., C Ashande, M., L Liesse, J.M. & Kikuni, T. (2016). Anti-sickling and bacterial inhibitory effects of two medicinal foods from Congo River Basin: *Gnetum africanum* Welw.(Gnetaceae) and *Grewia coriacea* Mast.(Malvaceae). *Current Traditional Medicine*, 2(1), 34-41.
178. Titilayo, G.I. & Adeyemi, E. (2010). Phytochemical screening and in vitro anticandidal activity of extracts and essential oil of *Curculigo pilosa* (Schum and Thonn) Engl. Hypoxidaceae. *African Journal of Biotechnology*, 9(8), 1236-1240.
179. Nie, Y., Dong, X., He, Y., Yuan, T., Han, T., Rahman, K., Qin, L. & Zhang, Q. (2013). Medicinal plants of genus Curculigo: traditional uses and a phytochemical and ethnopharmacological review. *Journal of Ethnopharmacology*, 147(3), 547-563.
180. Ezeigbo, I. (2010). Antidiabetic potential of methanolic leaf extracts of *Icacina trichantha* in alloxan-induced diabetic mice. *International Journal of Diabetes in Developing Countries*, 30(3), 150.
181. Timothy, O. & Idu, M. (2011). Preliminary phytochemistry and *in vitro* antimicrobial properties of aqueous and methanol extracts of *Icacina trichantha* Oliv. leaf. *International Journal of Medicinal and Aromatic Plants*, 1(3), 184-188.
182. El-Mahmood, A.M., Doughari, J.H. & Kiman, H.S. (2010). *In vitro* antimicrobial activity of crude leaf and stem bark extracts of *Gmelina arborea* (Roxb) against some pathogenic species of Enterobacteriaceae. *African Journal of Pharmacy and Pharmacology*, 4(6), 355-361.
183. Wansi, S.L., Nyadjeu, P., Nguelefack, T.B., Fodouop, S.F., Donatien, A.A. & Kamanyi, A. (2012). *In vivo* antioxidant and vasodilating activities of *Gmelina arborea* (Verberaceae) leaves hexane extract. *Journal of Complementary and Integrative Medicine*, 9(1).

184. Lawson, R., Awede, B., Osseni, R., Gbaguidi, F., Gbenou, J. & Laleye, A. (2016). Effects of *Gmelina arborea*, Roxb (Verbenaceae) aqueous extract on arterial pressure of Wistar rats. *Journal of Physiology and Pathophysiology*, 7(1), 1-6.
185. Akinmoladun, A.C., Ibukun, E.O., Afor, E., Obuotor, E.M. & Farombi, E.O. (2007). Phytochemical constituent and antioxidant activity of extract from the leaves of *Ocimum gratissimum*. *Scientific Research and Essays*, 2(5), 163-166.
186. Prabhu, K.S., Lobo, R., Shirwaikar, A.A. & Shirwaikar, A. (2009). *Ocimum gratissimum*: a review of its chemical, pharmacological and ethnomedicinal properties. *The Open Complementary Medicine Journal*, 1(1-15).
187. Mombeini, T., Mombeini, M. & Aghayi, M. (2009). Evaluation of pharmacological effects of *Origanum genus* (Origanum spp.). *Journal of Medicinal Plants*, 8(29), 18-189.
188. Pimple, B.P., Kadam, P.V. & Patil, M.J. (2012). Comparative antihyperglycaemic and antihyperlipidemic effect of *Origanum majorana* extracts in NIDDM rats. *Oriental Pharmacy and Experimental Medicine*, 12(1), 41-50.
189. Dhull, S.B., Kaur, P. & Purewal, S.S. (2016). Phytochemical analysis, phenolic compounds, condensed tannin content and antioxidant potential in Marwa (*Origanum majorana*) seed extracts. *Resource-Efficient Technologies*, 2(4), 168-174.
190. Arukwe, U., Amadi, B.A., Duru, M.K.C., Agomuo, E.N., Adindu, E.A., Odika, P.C., Lele, K.C., Egejuru, L. & Anudike, J., 2012. Chemical composition of *Persea americana* leaf, fruit and seed. *International Journal of Recent Research and Applied Studies*, 11(2), 346-349.
191. Odubanjo, V.O., Oboh, G. & Makinde, O.A. (2016). Inhibitory effect of aqueous extracts of avocado pear (*Persea americana*) leaf and seed on angiotensin 1-converting enzyme: a possible means in treating/managing hypertension. *Journal of Applied Life Sciences International*, 4(1), 1-9.
192. Agunu, A., Yusuf, S., Andrew, G.O., Zezi, A.U. & Abdurahman, E.M. (2005). Evaluation of five medicinal plants used in diarrhoea treatment in Nigeria. *Journal of Ethnopharmacology*, 101(1-3), 27-30.
193. Bolanle, J.D., Adetoro, K.O., Balarabe, S.A. & Adeyemi, O.O. (2014). Hepatocurative potential of *Vitex doniana* root bark, stem bark and leaves extract against CCl4–induced liver damage in rats. *Asian Pacific Journal of Tropical Biomedicine*, 4(6), 480-485.
194. Anyanwu, G.O., Onyeneke, C.E. & Rauf, K. (2015). Medicinal plants of the genus Anthocleista—A review of their ethnobotany, phytochemistry and pharmacology. *Journal of Ethnopharmacology*, 175, 648-667.
195. Okoli, A.S. & Iroegbu, C.U. (2004). Evaluation of extracts of *Anthocleista djalonensis, Nauclea latifolia* and *Uvaria afzalii* for activity against bacterial isolates from cases of non-gonococcal urethritis. *Journal of Ethnopharmacology*, 92(1), 135-144.
196. Ekhaise, F.O., Ofoezie, V.G. & Enobakhare, D.A. (2010). Antibacterial properties and preliminary phytochemical analysis of methanolic extract of mistletoe (*Tapinanthus bangwensis*). *Bayero Journal of Pure and Applied Sciences*, 3(2), 5-68.
197. Adegoke, B.M. & Oloyede, O.B. (2013). Antihyperglycaemic and antihyperproteinaemic activity of extracts of *Picralima nitida* seed and *Tapinanthus bangwensis* leaf on alloxan-induced diabetic rabbits. *International Journal of Innovation and Applied Studies*, 3(4), 1125-1131.
198. Rahul, J., Jain, M.K., Singh, S.P., Kamal, R.K., Naz, A., Gupta, A.K. & Mrityunjay, S.K. (2015). *Adansonia digitata* L. (baobab): a review of traditional information and taxonomic description. *Asian Pacific Journal of Tropical Biomedicine*, 5(1), 79-84.
199. Kamatou, G.P.P., Vermaak, I. & Viljoen, A.M. (2011). An updated review of *Adansonia digitata*: A commercially important African tree. *South African Journal of Botany*, 77(4), 908-919.
200. Sene, M., Kane, M.O., Sene, M., Barboza, F.S., Sow, A.K., Diaw, M., Ba, F., Sarr, M. & Diallo, A.S. (2016). *Adansonia digitata* causes redox-sensitive endothelium-dependent relaxation involving no in porcine coronary artery. *Journal of Physiology and Pharmacology Advances*, 6(6), 880-886.
201. Djomeni, P.D.D., Tédong, L., Asongalem, E.A., Dimo, T., Sokeng, S.D. & Kamtchouing, P. (2006). Hypoglycaemic and antidiabetic effect of root extracts of *Ceiba pentandra* in normal and diabetic rats. *African Journal of Traditional, Complementary and Alternative Medicines*, 3(1), 129-136.
202. Friday, E.T., James, O., Olusegun, O. & Gabriel, A. (2011). Investigations on the nutritional and medicinal potentials of *Ceiba pentandra* leaf: A common vegetable in Nigeria. *International Journal of Plant Physiology and Biochemistry*, 3(6), 95-101.
203. Loganayaki, N., Siddhuraju, P. & Manian, S. (2013). Antioxidant activity and free radical scavenging capacity of phenolic extracts from *Helicteres isora* L. and *Ceiba pentandra* L. *Journal of Food Science and Technology*, 50(4), 687-695.
204. Oboh, G., Akomolafe, T.L., Adefegha, S.A. & Adetuyi, A.O. (2012). Attenuation of cyclophosphamide-induced neurotoxicity in rat by yellow dye extract from root of Brimstone tree (*Morinda lucida*). *Experimental and Toxicologic Pathology*, 64(6), 591-596.
205. Islam, M.M. (2013). Biochemistry, medicinal and food values of jute (*Corchorus capsularis* L. and *C. olitorius* L.) leaf: A review. *International Journal of Enhanced Research in Science Technology and Engineering*, 2(11), 135-44.
206. Sadat, A., Hore, M., Chakraborty, K., & Roy, S. (2017). Phytochemical analysis and antioxidant activity of methanolic extract of leaves of *Corchorus*

olitorius. *International Journal of Current Pharmaceutical Research*, 9(5), 59-63.

207. Patel, R., Patel, A., Desai, S. & Nagee, A. (2012). Study of secondary metabolites and antioxidant properties of leaves, stem and root among *Hibiscus rosa-sinensis* cultivars. *Asian Journal of Experimental Biology and Science*, 3(4), 719-725.
208. Kate, I.E. & Lucky, O.O. (2010). The effects of aqueous extracts of the leaves of *Hibiscus rosa-sinensis* Linn on renal function in hypertensive rats. *African Journal of Biochemistry Research,* 4(2), 043-046.
209. Herrera-Arellano, A., Miranda-Sánchez, J., Ávila-Castro, P., Herrera-Álvarez, S., Jiménez-Ferrer, J.E., Zamilpa, A., Román-Ramos, R., Ponce-Monter, H. & Tortoriello, J. (2007). Clinical effects produced by a standardized herbal medicinal product of *Hibiscus sabdariffa* on patients with hypertension. A randomized, double-blind, lisinopril-controlled clinical trial. *Planta Medica,* 73(01), 6-12.
210. Alarcón-Alonso, J., Zamilpa, A., Aguilar, F.A., Herrera-Ruiz, M., Tortoriello, J. & Jimenez-Ferrer, E. (2012). Pharmacological characterization of the diuretic effect of *Hibiscus sabdariffa* Linn (Malvaceae) extract. *Journal of Ethnopharmacology*, 139, 751–756.
211. Da-Costa-Rocha, I., Bonnlaender, B., Sievers, H., Pischel, I. & Heinrich, M. (2014). Hibiscus sabdariffa L.–A phytochemical and pharmacological review. *Food Chemistry*, 165, 424-443.
212. Sultana, S., Al Faruq, A., Nahid-Al-Rashid, D., Nasim, T. & Ahsan, M.Q. (2018). *In-vitro* anti-inflammatory, anti-oxidant and *in-vivo* analgesic, anti-diarrheal activities of fractional leaf extracts of *Hibiscus surattensis*. *European Journal of Pharmaceutical and Medical Research.* 5(4), 167-173.
213. Raimi, M.M., Oyekanmi, A.M. & Adegoke, B.M. (2014). Proximate, phytochemical and micronutrient composition of *Sida acuta*. *Journal of Applied Chemistry,* 7(2), 93-98.
214. Kannan, R.R. & Vincent, S.G.P. (2012). *Cynodon dactylon* and *Sida acuta* extracts impact on the function of the cardiovascular system in zebrafish embryos. *Journal of Biomedical Research*, 26(2), 90-97
215. Chaves, O.S., Gomes, R.A., Tomaz, A.C.D.A., Fernandes, M.G., das Graças Mendes Junior, L., de Fátima Agra, M., Braga, V.A. & de Fátima Vanderlei de Souza, M. (2013). Secondary metabolites from *Sida rhombifolia* L. (Malvaceae) and the vasorelaxant activity of cryptolepinone. *Molecules*, 18(3), 2769-2777.
216. Hamidu, A.A., 2012. Phytochemical constituents of the leaves of Sterculia setigera. *J Pharm*, 2(1), 062-064.
217. Ouédraogo, M., Konaté, K., Zerbo, P., Barro, N. & Sawadogo, L.L. (2013). Phytochemical analysis and" *in vitro*" antifungal profile of bioactive fractions from" *Sterculia setigera*"(Sterculiaceae). *Current Research Journal of Biological Sciences*, 5(2), 75-80.
218. Babalola, I.T. & Adelakun, E.A. (2013). Isolation of stigmast-5-en-3β-ol (β-sitosterol) from dichloromethane extract of *Sterculia setigera* leaves (Sterculiaceae). *Archives of Applied Science Research*, 5, 16-19.
219. Olayinka, A.O., Onoruvwe, O. & Lot, T.Y. (1992). Cardiovascular effects in rodents of the methanolic extract of the stem bark of *Khaya senegalensis* A. Juss. *Phytotherapy Research*, 6(5), 282-284.
220. Zhou, M.M., Zhang, W.Y., Li, R.J., Guo, C., Wei, S.S., Tian, X.M., Luo, J. & Kong, L.Y. (2018). Anti-inflammatory activity of Khayandirobilide A from *Khaya senegalensis* via NF-κB, AP-1 and p38 MAPK/Nrf2/HO-1 signaling pathways in lipopolysaccharide-stimulated RAW 264.7 and BV-2 cells. *Phytomedicine*, 42, 152-163.
221. Onabanjo, A.O., John, T.A., Sokale, A.A. & Samuel, O.T. (1991). Analgesic and antiinflammatory effects of *Chasmanthera dependens*. *International Journal of Pharmacognosy*, 29(1), 24-28.
222. Okiei, W., Ogunlesi, M. & Ademoye, M.A. (2009). An assessment of the antimicrobial properties of extracts of various polarities from *Chasmanthera dependens*, *Emilia coccinea* and *Cuscuta australis*, herbal medications for eye diseases. *Journal of Applied Sciences (Faisalabad)*, 9(22), 4076-4080.
223. Tijani, S.A., Olaleye, S.B. & Farombi, E.O. (2018). Anti-ulcerogenic effect of the methanol extract of *Chasmanthera dependens* (Hochst) stem on male Wistar rats. *Journal of Basic and Clinical Physiology and Pharmacology*, 29(4), 377-383.
224. Hullatti, K.K. & Sharada, M.S. (2010). Comparative phytochemical investigation of the sources of ayurvedic drug Patha: a chromatographic fingerprinting analysis. *Indian Journal of Pharmaceutical Sciences*, 72(1), 39-45
225. Singh, B.K., Pillai, K.K., Kohli, K. & Haque, S.E. (2013). Effect of *Cissampelos pareira* root extract on isoproterenol-induced cardiac dysfunction. *Journal of Natural Medicines*, 67(1), 51-60.
226. Sayana, S.B., Christina, T.M.S.P. & Patil, P. (2014). Study of diuretic activity of ethonolic extract of leaves of Cissampelos pareira in rats. *Asian Journal of Pharmaceutical and Clinical Research*, 7(4), 157-159.
227. Piero, N.M., Eliud, N.N.M., Susan, K.N., George, O.O. & David, N.J.M.M. (2015). *In vivo* antidiabetic activity and safety in rats of *Cissampelos pareira* traditionally used in the management of diabetes mellitus in Embu County, Kenya. *Journal of Drug Metabolism and Toxicology*, 6, 184.
228. Ekeanyanwu, R.C., Udeme, A.A., Onuigbo, A.O. & Etienajirhevwe, O.F. (2012). Anti-diabetic effect of ethanol leaf extract of *Cissampelos owariensis* (lungwort) on alloxan induced diabetic rats. *African Journal of Biotechnology*, 11(25), 6758-6762.
229. Olutayo, O., Abayomi, O., Olakunle, F., Temitope, A. & Ibrahim, I. (2013). The chemical composition of essential oil from the root of *Cissampelos owariensis* (p. beauv) and free radical scavenging

activities of its extracts. *African Journal of Pure and Applied Chemistry*, 7(6), 225-230.
230. Earnest, E.O., Goodies, M.E. & Chinwuba, P. (2015). *Cissampelos owariensis*: Experimental review. *The Pharma Innovation*, 3(11B), 75.
231. Ali, A., Akhtar, N., Khan, B.A., Khan, M.S., Rasul, A., Khalid, N., Waseem, K., Mahmood, T. & Ali, L. (2012). *Acacia nilotica*: a plant of multipurpose medicinal uses. *Journal of Medicinal Plants Research*, 6(9), 1492-1496.
232. Orishadipe, A.T., Okogun, J.I. & Mishelia, E. (2010). Gas chromatography mass spectrometry analysis of the hexane extract of *Calliandra portoricensis* and its antimicrobial activity. *African Journal of Pure and Applied Chemistry*, 4(7), 131-134.
233. Amujoyegbe, O.O., Agbedahunsi, J.M. & Akanmu, M.A., (2014). Antisickling properties of two Calliandra species: *C. portoricensis* and *C. haematocephala* (Fabaceae). *European Journal of Medicinal Plants*, 206-219.
234. Adaramoye, O., Erguen, B., Oyebode, O., Nitzsche, B., Höpfner, M., Jung, K. & Rabien, A. (2015). Antioxidant, antiangiogenic and antiproliferative activities of root methanol extract of *Calliandra portoricensis* in human prostate cancer cells. *Journal of Integrative Medicine*, 13(3), 185-193.
235. Okorie, C.C., Oparaocha, E.N., Adewunmi, C.O., Iwalewa, E.O. & Omodara, S.K. (2006). Antinociceptive, anti-inflammatory and cytotoxic activities of *Pentaclethra macrophylla* aqueous extracts in mice. *African Journal of Traditional, Complementary and Alternative Medicines,* 3(1), 44-53.
236. Ezeonu, C.S. & Ejikeme, C.M. (2016). Qualitative and quantitative determination of phytochemical contents of indigenous Nigerian softwoods. *New Journal of Science*, *2016*.
237. Adesina, S.K., Iwalewa, E.O. & Johnny, I.I. (2016). *Tetrapleura tetraptera* Taub-Ethnopharmacology, chemistry, medicinal and nutritional values—a review. *British Journal of Pharmaceutical Research*, 12(3), 1-22.
238. Ojo, O.A., Ajiboye, B.O., Ojo, A.B., Onikanni, S.A. & Olarewaju, O.I. (2014). Phytochemical, proximate analysis and mineral composition of aqueous crude extract of *Ficus asperifolia* Miq. *Phytochemical, Proximate Analysis and Mineral Composition of Aqueous Crude Extract of Ficus Asperifolia Miq*, 1(1), 1-4.
239. Nwankwo, I.U. & Ukaegbu-Obi, K.M. (2014). Preliminary phytochemical screening and antibacterial activity of two Nigerian medicinal plants (*Ficus asperifolia* and *Terminalis catappa*). *Journal of Medicinal Plant and Herbal Therapy Research*, 2, 1-5.
240. Olaiya, C.O., Omolekan, T.O., Esan, A.M. & Adediran, B.J. (2015). Renal, cardiac and osteo–protective effects of beta–sitosterol glycoside in hypertensive rats. *Advances in Life Science and Technology*, 39, 13-18.
241. Mpiana, P.T., Mudogo, V., Tshibangu, D.S.T., Kitwa, E.K., Kanangila, A.B., Lumbu, J.B.S., Ngbolua, K.N., Atibu, E.K. & Kakule, M.K. (2008). Antisickling activity of anthocyanins from *Bombax pentadrum*, *Ficus capensis* and *Ziziphus mucronata*: photodegradation effect. *Journal of Ethnopharmacology*, 120(3), 413-418.
242. Adebayo-Tayo, B.C. & Odeniyi, A.O. (2012). Phytochemical screening and microbial inhibitory activities of *Ficus Capensis*. *African Journal of Biomedical Research*, 15(1), 35-40.
243. Akomolafe, S.F., Oboh, G., Oyeleye, S.I. & Boligon, A.A. (2016). Aqueous extract from *Ficus capensis* leaves inhibits key enzymes linked to erectile dysfunction and prevent oxidative stress in rats' penile tissue. *NFS Journal*, 4, 15-21.
244. Adebayo, E.A., Ishola, O.R., Taiwo, O.S., Majolagbe, O.N. & Adekeye, B.T. (2009). Evaluations of the methanol extract of *Ficus exasperata* stem bark, leaf and root for phytochemical analysis and antimicrobial activities. *African Journal of Plant Science*, 3(12), 283-287.
245. Mensah, T.L. & Amoh-Barimah, A.K. (2009). An evaluation of the antiinflammatory, antipyretic and antinociceptive effects of *Ficus exasperata* (Vahl) leaf extract. *Journal of Pharmacology and Toxicology*, 4(4), 138-151.
246. Anowi, C.F., Umanah, U., Emezie, A.U. & Utoh-Nedosa, A.U. (2012). Anti-diarrhoeal, antispasmodic and phytochemical properties of ethanol extract of the leaves of *Ficus exasperate*. *Asian Journal of Research in Pharmaceutical Science*, 2(1), 26-32.
247. Oboh, G., Akinyemi, A.J., Osanyinlusi, F.R., Ademiluyi, A.O., Boligon, A.A. & Athayde, M.L. (2014). Phenolic compounds from sandpaper (*Ficus exasperata*) leaf inhibits angiotensin I converting enzyme in high cholesterol diet fed rats. *Journal of Ethnopharmacology*, 157, 119-125.
248. Dangi, S.Y., Jolly, C.I. & Narayanan, S. (2002). Antihypertensive activity of the total alkaloids from the leaves of *Moringa oleifera*. *Pharmaceutical Biology*, 40(2), 144-148.
249. Chuang, P.H., Lee, C.W., Chou, J.Y., Murugan, M., Shieh, B.J. & Chen, H.M. (2007). Anti-fungal activity of crude extracts and essential oil of *Moringa oleifera* Lam. *Bioresource Technology*, 98(1), 232-236.
250. Nweze, N.O. & Nwafor, F.I. (2014). Phytochemical, proximate and mineral composition of leaf extracts of *Moringa oleifera* Lam. from Nsukka, South-Eastern Nigeria.
251. Swathi, D., Jyothi, B. & Sravanthi, C. (2011). A review: pharmacognostic studies and pharmacological actions of *Musa Paradisiaca*. International *Journal of Innovative Pharmaceutical Research,* 2(2), 122-125.
252. Shodehinde, S.A. & Oboh, G. (2012). *In vitro* antioxidant activities and inhibitory effects of aqueous extracts of unripe plantain pulp (*Musa paradisiaca*) on enzymes linked with Type 2

diabetes and hypertension. *Journal of Toxicology and Environmental Health Sciences*, 4(4), 65-75.

253. Pari, L. & Maheswari, J.U. (1999). Hypoglycaemic effect of *Musa sapientum* L. in alloxan-induced diabetic rats. *Journal of Ethnopharmacology*, 68(1-3), 321-325.
254. Imam, M.Z. & Akter, S. (2011). Musa paradisiaca L. and Musa sapientum L.: A phytochemical and pharmacological review. *Journal of Applied Pharmaceutical Science*, 1(5), 14-20.
255. Barbalho, S.M., Farinazzi-Machado, F.M.V., de Alvares Goulart, R., Brunnati, A.C.S., Otoboni, A.M. & Ottoboni, B. (2012). *Psidium guajava* (Guava): A plant of multipurpose medicinal applications. *Medicinal and Aromatic Plants*, 1(4), 104-109.
256. Irondi, E.A., Agboola, S.O., Oboh, G., Boligon, A.A., Athayde, M.L. & Shode, F.O. (2016). Guava leaves polyphenolics-rich extract inhibits vital enzymes implicated in gout and hypertension in vitro. *Journal of Intercultural Ethnopharmacology*, 5(2), 122-130.
257. Patten, G.S., Abeywardena, M.Y., Head, R.J. & Bennett, L.E. (2012). Processed dietary plants demonstrate broad capacity for angiotensin converting enzyme and angiotensin II receptor binding inhibition in vitro. *Journal of Functional Foods*, 4(4), 851-863.
258. Bhowmik, D., Kumar, K.S., Yadav, A., Srivastava, S., Paswan, S. & Dutta, A.S. (2012). Recent trends in Indian traditional herbs *Syzygium aromaticum* and its health benefits. *Journal of Pharmacognosy and Phytochemistry*, 1(1), 13-22.
259. Mittal, M., Gupta, N., Parashar, P., Mehra, V. & Khatri, M. (2014). Phytochemical evaluation and pharmacological activity of *Syzygium aromaticum*: a comprehensive review. *International Journal of Pharmacy and Pharmaceutical Sciences*, 6(8), 67-72.
260. Hansen, K., Adsersen, A., Christensen, S.B., Jensen, S.R., Nyman, U. & Smitt, U.W. (1996). Isolation of an angiotensin converting enzyme (ACE) inhibitor from *Olea europaea* and *Olea lancea*. *Phytomedicine*, 2(4), 319-325.
261. Khayyal, M.T., El-Ghazaly, M.A., Abdallah, D.M., Nassar, N.N., Okpanyi, S.N. & Kreuter, M.H. (2002). Blood pressure lowering effect of an olive leaf extract (*Olea europaed*) in L-NAME induced hypertension in rats. *Arzneimittelforschung*, 52(11), 797-802.
262. Hashmi, M.A., Khan, A., Hanif, M., Farooq, U. & Perveen, S. (2015). Traditional uses, phytochemistry, and pharmacology of *Olea europaea* (olive). *Evidence-Based Complementary and Alternative Medicine*, 2015.
263. Onwuliri, F.C., Mawak, J.D., Wonang, D.L. & Onwuliri, E.A. (2006). Phytochemical, toxicological and histopathological studies of some medicinal plants in Nigeria. *International Journal of Natural and Applied Sciences*, 2(3), 225-229
264. Noufou, O., Wamtinga, S.R., André, T., Christine, B., Marius, L., Emmanuelle, H.A., Jean, K., Marie-Geneviève, D. & Pierre, G.I. (2012). Pharmacological properties and related constituents of stem bark of *Pterocarpus erinaceus* Poir. (Fabaceae). *Asian Pacific Journal of Tropical Medicine*, 5(1), 46-51.
265. Dedehou, V.F.G.N., Olounladé, P.A., Alowanou, G.G., Azando, E.V.B. & Hounzangbé-Adoté, S. (2016). A review on medicinal plants of *Parkia biglobosa* (Mimosaceae-Fabaceae) and *Pterocarpus erinaceus* (Leguminosae-Papilionoidea). *Journal of the Mechanics and Physics of Solids,* 4(6), 132-137.
266. Wei, L.S., Wee, W., Siong, J.Y.F. & Syamsumir, D.F. (2011). Characterization of anticancer, antimicrobial, antioxidant properties and chemical compositions of *Peperomia pellucida* leaf extract. *Acta Medica Iranica*, 49(10), 670-674.
267. Mensah, J.K., Okoli, R.I., Turay, A.A. & Ogie-Odia, E.A. (2009). Phytochemical analysis of medicinal plants used for the management of hypertension by Esan people of Edo state, Nigeria. *Ethnobotanical Leaflets*, 13, 1273-1287.
268. Agbor, G.A., Akinfiresoye, L., Sortino, J., Johnson, R. & Vinson, J.A. (2012). Piper species protect cardiac, hepatic and renal antioxidant status of atherogenic diet fed hamsters. *Food Chemistry*, 134(3), 1354-1359.
269. Oboh, G., Ademosun, A.O., Odubanjo, O.V. & Akinbola, I.A. (2013). Antioxidative properties and inhibition of key enzymes relevant to type-2 diabetes and hypertension by essential oils from black pepper. *Advances in Pharmacological Sciences*, 2013.
270. Okaraonye, C.C. & Ikewuchi, J.C. (2009). Nutritional and antinutritional components of *Pennisetum purpureum* (Schumach). *Pakistan Journal of Nutrition*, 8(1), 32-34.
271. Ali, M., Diso, S.U., Minjibir, A.A., Sani, J.A., Nas, F.S. & Yahaya, A. (2017). Assessments of Medicinal Plants Used in Treatment of Various Ailments in Kano City, Nigeria. *Asian Journal of Biotechnology and Bioresource Technology* 2(4), 1-11.
272. Agbangnan, P.D., Tachon, C., Bonin, H., Chrostowka, A., Fouquet, E. & Sohounhloue, D.C. (2012). Phytochemical study of a tinctorial plant of Benin traditional pharmacopoeia: The red sorghum (*Sorghum caudatum*) of Benin. *Scientific Study and Research. Chemistry and Chemical Engineering, Biotechnology, Food Industry*, 13(2), 121-135
273. Nwinyi, F.C., Kwanashie, H.O., Ahmad, A.A. & Odama, L.E. (2009). Evaluation of toxicity profile of leaf base extract of *Sorghum bicolor* in rat. *African Journal of Biotechnology*, 8(2), 334-342
274. Akande, I.S., Oseni, A.A. & Biobaku, O.A. (2010). Effects of aqueous extract of *Sorghum bicolor* on hepatic, histological and haematological indices in rats. *Journal of Cell and Animal Biology*, 4, 137-142.
275. Mpiana, P.T., Lombe, B.K., Ombeni, A.M., Tshibangu, D.S., Wimba, L.K., Tshilanda, D.D., Mushagalusa, F.K. & Muyisa, S.K., (2013). *In vitro* sickling inhibitory effects and anti-sickle erythrocytes hemolysis of *Dicliptera colorata* CB

Clarke, *Euphorbia hirta* L. and *Sorghum bicolor* (L.) Moench. *Open Journal of Blood Diseases*, 3(01), 43-48

276. Kwon, Y.I., Apostolidis, E., Kim, Y.C. & Shetty, K. (2007). Health benefits of traditional corn, beans, and pumpkin: *in vitro* studies for hyperglycemia and hypertension management. *Journal of Medicinal Food*, 10(2), 266-275.
277. Thoudam, B., Kirithika, T., Ramya, J. & Usha, K. (2011). Phytochemical constituents and antioxidant activity of various extracts of corn silk (*Zea mays* L). *Research Journal of Pharmaceutical, Biological and Chemical Sciences*, 2(4), 986-993.
278. Hasanudin, K., Hashim, P. & Mustafa, S. (2012). Corn silk (*Stigma maydis*) in healthcare: a phytochemical and pharmacological review. *Molecules*, 17(8), 9697-9715.
279. Ojewole, J.A.O. & Odebiyi, O.O. (1983). Cardiovascular actions of aqueous extracts from the leaves of *Securidaca longipedunculata* (Polygalaceae). *International Journal of Crude Drug Research*, 21(1), 15-20.
280. Ojewole, J.A.O. (2008). Analgesic, anti-inflammatory and hypoglycaemic effects of *Securidaca longepedunculata* (Fresen.) [Polygalaceae] root-bark aqueous extract. *Inflammopharmacology*, 16(4), 174-181.
281. Ndamitso, M.M., Mohammed, A., Jimoh, T.O., Idris, S., Oyeleke, S.B. & Etsuyankpa, M.B. (2013). Phytochemical and antibacterial activity of *Securidaca longepedunculata* on selected pathogens. *African Journal of Microbiology Research*, 7(50), 5652-5656.
282. Yousefi, F., Mahjoub, S., Pouramir, M. & Khadir, F. (2013). Hypoglycemic activity of *Pyrus biossieriana* Buhse leaf extract and arbutin: Inhibitory effects on alpha amylase and alpha glucosidase. *Caspian Journal of Internal Medicine*, 4(4), 763.
283. Zbigniew, S., Beata, Ż., Kamil, J., Roman, F., Barbara, K. & Andrzej, D. (2014). Antimicrobial and antiradical activity of extracts obtained from leaves of three species of the genus pyrus. *Microbial Drug Resistance*, 20(4), 337-343.
284. Sharma, K., Pasricha, V., Satpathy, G. & Gupta, R.K. (2015). Evaluation of phytochemical and antioxidant activity of raw *Pyrus communis* (l), an underexploited fruit. *Journal of Pharmacognosy and Phytochemistry*, 3(5), 46-50
285. Ninomiya, K., Matsuda, H., Kubo, M., Morikawa, T., Nishida, N. & Yoshikawa, M. (2007). Potent anti-obese principle from *Rosa canina*: structural requirements and mode of action of trans-tiliroside. *Bioorganic and Medicinal Chemistry Letters*, 17(11), 3059-3064.
286. Wenzig, E.M., Widowitz, U., Kunert, O., Chrubasik, S., Bucar, F., Knauder, E. & Bauer, R. (2008). Phytochemical composition and *in vitro* pharmacological activity of two rose hip (*Rosa canina* L.) preparations. *Phytomedicine*, 15(10), 826-835.
287. Winther, K., Hansen, A.S.V. & Campbell-Tofte, J. (2016). Bioactive ingredients of rose hips (*Rosa canina* L) with special reference to antioxidative and anti-inflammatory properties: in vitro studies. *Botanics*, 6, 11-23
288. Salawu, O.A., Chindo, B.A., Tijani, A.Y., Obidike, I.C., Salawu, T.A. & Akingbasote, A.J. (2009). Acute and sub-acute toxicological evaluation of the methanolic stem bark extract of *Crossopteryx febrifuga* in rats. *African Journal of Pharmacy and Pharmacology*, 3(12), 621-626.
289. Adeola, S.O., Yahaya, T.A., Hafsatu, B., Chinwe, N.A., Ezeonu, M.C., Igwe, S. & Ndukuba, M.A. (2011). Gastro-protective effect of *Crossopteryx febrifuga* in Wistar rats. *African Journal of Traditional, Complementary and Alternative Medicines*, 8(3), 300-306.
290. Halilu, M.E., Abubakar, A., Garbar, M.K. & Isah, A.A. (2012). Antimicrobial and preliminary phytochemical studies of methanol extract of root bark of *Crossopteryx febrifuga* (Rubiaceae). *Journal of Applied Pharmaceutical Science*, 2(12), 66-70
291. Ebong, P.E., Igile, G.O., Mgbeje, B.I.A., Iwara, I.A., Odongo, A.E., Onofiok, U.L. & Oso, E.A. (2014). Hypoglycemic, hepatoprotective and nephroprotective effects of methanolic leaf extract of *Heinsia crinita* (Rubiaceae) in alloxan-induced diabetic albino Wistar rats. *IOSR Journal of Pharmacy*, 4, 37-43.
292. Nwanna, E.E., Oboh, G., Adedayo, B.C., Adewuni, T.M. & Ejakpovi, I. (2015). Biological effect of aqueous extract of *Heinsia crinita* on lipid peroxidation and angiotensin-1-converting enzyme *in vitro*. *Biosciences Research in Today's World*, 1, 47-54.
293. Oboh, G., Nwanna, E.E., Oyeleye, S.I., Olasehinde, T.A., Ogunsuyi, O.B. & Boligon, A.A. (2016). *In vitro* neuroprotective potentials of aqueous and methanol extracts from *Heinsia crinita* leaves. *Food Science and Human Wellness*, 5(2), 95-102.
294. Kazeem, M.I., Adamson, J.O. & Ogunwande, I.A. (2013). Modes of inhibition of α-amylase and α-glucosidase by aqueous extract of *Morinda lucida* Benth leaf. *BioMed Research International*, 2013.
295. Appiah-Opong, R., Tuffour, I., Annor, G.K., Doris, A., Blankson-Darku, P.C., Kissi-Twum, A.A., Uto, T. & Ocloo, A. (2016). Antiproliferative, antioxidant activities and apoptosis induction by *Morinda lucida* and *Taraxacum officinale* in human HL-60 leukemia cells. *Journal of Global Biosciences*, 5(7), 4281-4291.
296. Owolabi, O.J., Nworgu, Z.A.M. & Odushu, K. (2010). Antidiarrheal evaluation of the ethanol extract of *Nauclea latifolia* root bark. *Methods and Findings in Experimental and Clinical Pharmacology* 32, 551-555.
297. Agomuoh, A.A., Ata, A., Udenigwe, C.C., Aluko, R.E. & Irenus, I. (2013). Novel indole alkaloids from *Nauclea latifolia* and their renin-inhibitory activities. *Chemistry and Biodiversity*, 10(3), 401-410.
298. Ajibesin, K.K., Bala, D.N. & Umoh, U.F. (2012). Ethno medicinal survey of plants used by the indigenes of Rivers State of Nigeria. *Pharmaceutical Biology*, 50(9), 1123-1143.

299. Shalaby, N.M., Abd-Alla, H.I., Ahmed, H.H. & Basoudan, N. (2011). Protective effect of *Citrus sinensis* and *Citrus aurantifolia* against osteoporosis and their phytochemical constituents. *Journal of Medicinal Plants Research*, 5(4), 579-588.
300. Akhtar, S. (2013). Evaluation of cardiovascular effects of *Citrus aurantifolia* (Linn.) fruit. *Available at SSRN 2279447*.
301. Oboh, G., Bello, F.O., Ademosun, A.O., Akinyemi, A.J. & Adewuni, T.M. (2015). Antioxidant, hypolipidemic, and anti-angiotensin-1-converting enzyme properties of lemon (*Citrus limon*) and lime (*Citrus aurantifolia*) juices. *Comparative Clinical Pathology*, 24(6), 1395-1406.
302. Adesina, S.K. (2005). The Nigerian Zanthoxylum; chemical and biological values. *African Journal of Traditional, Complementary and Alternative Medicines*, 2(3), 282-301.
303. Adefisoye, M.A., AjibadeAko-Nai, K. & Bisi-Johnson, M.A. (2012). Phytochemical and antibacterial activity of the extracts of *Fagara zanthoxyloides* on selected cariogenic and enteric bacterial isolates. *Journal of Complementary Medicine Research*, 1(1), 1-6.
304. Ekere, O.U., Ogunka-Nnoka, C.U. & Monago-Ighorodje, C.C. (2019). Hepatotoxicity and Nephrotoxicity Studies of Ethanol Extracts of *Annona muricata* Leaves and *Fagara Zanthoxyloide* Roots on Zidovudine-Induced Wistar Rats. *International Journal of Toxicology*, 4(1), 045-053.
305. Ofem, O.E., Eno, A.E., Imoru, J., Nkanu, E., Unoh, F. & Ibu, J.O. (2007). Effect of crude aqueous leaf extract of *Viscum album* (mistletoe) in hypertensive rats. *Indian Journal of Pharmacology*, 39(1), 15.
306. Gupta, G., Kazmi, I., Afzal, M., Rahman, M., Saleem, S., Ashraf, M.S., Khusroo, M.J., Nazeer, K., Ahmed, S., Mujeeb, M. & Ahmed, Z. (2012). Sedative, antiepileptic and antipsychotic effects of *Viscum album* L. (Loranthaceae) in mice and rats. *Journal of Ethnopharmacology*, 141(3), 810-816.
307. Poruthukaren, K.J., Palatty, P.L., Baliga, M.S. & Suresh, S. (2014). Clinical evaluation of *Viscum album* mother tincture as an antihypertensive: a pilot study. *Journal of Evidence-Based Complementary and Alternative Medicine*, 19(1), 31-35.
308. Zamble, A., Carpentier, M., Kandoussi, A., Sahpaz, S., Petrault, O., Ouk, T., Hennuyer, N., Fruchart, J.C., Staels, B., Bordet, R. & Duriez, P. (2006). *Paullinia pinnata* extracts rich in polyphenols promote vascular relaxation via endothelium-dependent mechanisms. *Journal of Cardiovascular Pharmacology*, 47(4), 599-608.
309. Adeyemo-Salami, O.A. & Makinde, J.M., (2013). Acute and sub-acute toxicity studies of the methanol extract of the leaves of *Paullinia pinnata* (Linn.) in wistar albino mice and rats. *African Journal of Medicine and Medical Sciences*, 42(1), 81-90.
310. Lunga, P.K., Qin, X.J., Yang, X.W., Kuiate, J.R., Du, Z.Z. & Gatsing, D. (2014). Antimicrobial steroidal saponin and oleanane-type triterpenoid saponins from *Paullinia pinnata*. *BMC Complementary and Alternative Medicine*, 14(1), 369-375
311. Kubmarawa, D., Ajoku, G.A., Enwerem, N.M. & Okorie, D.A. (2007). Preliminary phytochemical and antimicrobial screening of 50 medicinal plants from Nigeria. *African Journal of Biotechnology*, 6(14).
312. Rawat, A. & Mali, R.R. (2013). Phytochemical properties and pharmcological activities of *Nicotiana tabacum*: A review. *Indian Journal of Pharmaceutical and Biological Research*, 1(1), 74-82.
313. Sharma, Y., Dua, D., Nagar, A. & Srivastava, N.S. (2016). Antibacterial activity, phytochemical screening and antioxidant activity of stem of *Nicotiana tabacum*. *International Journal of Pharmaceutical Sciences and Research*, 7(3), 1156.
314. Kwon, Y.I., Apostolidis, E. & Shetty, K. (2007). Evaluation of pepper (*Capsicum annuum*) for management of diabetes and hypertension. *Journal of Food Biochemistry*, 31(3), 370-385.
315. Perazella, M.A. & Setaro, J.F. (2003). Renin-angiotensin-aldosterone system: fundamental aspects and clinical implications in renal and cardiovascular disorders. *Journal of Nuclear Cardiology*, 10(2), 184-196.
316. Yoshimura, M., Toyoshi, T., Sano, A., Izumi, T., Fujii, T., Konishi, C., Inai, S., Matsukura, C., Fukuda, N., Ezura, H. & Obata, A. (2009). Antihypertensive effect of a γ-aminobutyric acid rich tomato cultivar 'DG03-9'in spontaneously hypertensive rats. *Journal of Agricultural and Food Chemistry*, 58(1), 615-619.
317. Fuentes, E., Carle, R., Astudillo, L., Guzmán, L., Gutiérrez, M., Carrasco, G. & Palomo, I. (2013). Antioxidant and antiplatelet activities in extracts from green and fully ripe tomato fruits (*Solanum lycopersicum*) and pomace from industrial tomato processing. *Evidence-Based Complementary and Alternative Medicine*, 2013.
318. Biswas, D., Uddin, M.M., Dizdarevic, L.L., Jørgensen, A. & Duttaroy, A.K. (2014). Inhibition of angiotensin-converting enzyme by aqueous extract of tomato. *European Journal of Nutrition*, 53(8), 1699-1706.
319. Mensah, J.K., Okoli, R.I., Turay, A.A. & Ogie-Odia, E.A. (2009). Phytochemical analysis of medicinal plants used for the management of hypertension by Esan people of Edo state, Nigeria. *Ethnobotanical Leaflets*, 13, 1273-1287.
320. Aja, P.M., Okaka, A.N.C., Onu, P.N., Ibiam, U. & Urako, A.J. (2010). Phytochemical composition of *Talinum triangulare* (water leaf) leaves. *Pakistan Journal of Nutrition*, 9(6), 527-530.
321. Liao, D.Y., Chai, Y.C., Wang, S.H., Chen, C.W. & Tsai, M.S. (2015). Antioxidant activities and contents of flavonoids and phenolic acids of *Talinum triangulare* extracts and their immunomodulatory effects. *Journal of Food and Drug Analysis*, 23(2), 294-302.
322. Adeneye, A.A., Ajagbonna, O.P. & Ayodele, O.W. (2007). Hypoglycemic and antidiabetic activities on the stem bark aqueous and ethanol extracts of

Musanga cecropioides in normal and alloxan-induced diabetic rats. *Fitoterapia*, 78(7-8), 502-505.

323. Sowemimo, A., Okwuchuku, E., Samuel, F.M., Ayoola, O. & Mutiat, I. (2015). *Musanga cecropioides* leaf extract exhibits anti-inflammatory and anti-nociceptive activities in animal models. *Revista Brasileira de Farmacognosia*, 25(5), 506-512.
324. Nwidu, L.L., Oboma, Y.I., Elmorsy, E. & Carter, W.G. (2018). Hepatoprotective effect of hydromethanolic leaf extract of Musanga cecropioides (Urticaceae) on carbon tetrachloride-induced liver injury and oxidative stress. *Journal of Taibah University Medical Sciences*, 13(4), 344-354.
325. Saxena, M., Saxena, J. & Khare, S. (2012). A brief review on: Therapeutical values of *Lantana camara* plant. *International Journal of Pharmacy and Life Sciences*, 3(3), 1551-1554.
326. Naz, R. & Bano, A. (2013). Phytochemical screening, antioxidants and antimicrobial potential of *Lantana camara* in different solvents. *Asian Pacific Journal of Tropical Disease*, 3(6), 480-486.
327. Ogbonnia, S.O., Nkemehule, F.E. & Anyika, E.N. (2009). Evaluation of acute and subchronic toxicity of *Stachytarpheta angustifolia* (Mill) Vahl (Fam. Verbanaceae) extract in animals. *African Journal of Biotechnology*, 8(9).
328. Awah, F.M., Uzoegwu, P.N., Oyugi, J.O., Rutherford, J., Ifeonu, P., Yao, X.J., Fowke, K.R. & Eze, M.O. (2010). Free radical scavenging activity and immunomodulatory effect of *Stachytarpheta angustifolia* leaf extract. *Food Chemistry*, 119(4), 1409-1416.
329. Adigun, N.S., Oladiji, A.T. & Ajiboye, T.O. (2016). Antioxidant and anti-hyperlipidemic activity of hydroethanolic seed extract of *Aframomum melegueta* K. Schum in Triton X-100 induced hyperlipidemic rats. *South African Journal of Botany*, 105, 324-332.
330. Akpanabiatu, M.I., Ekpo, N.D., Ufot, U.F., Udoh, N.M., Akpan, E.J. & Etuk, E.U. (2013). Acute toxicity, biochemical and hematological study of *Aframomum melegueta* seed oil in male Wistar albino rats. *Journal of Ethnopharmacology*, 150(2), 590-594.
331. Ilic, N.M., Dey, M., Poulev, A.A., Logendra, S., Kuhn, P.E. & Raskin, I. (2014). Anti-inflammatory activity of grains of paradise (*Aframomum melegueta* Schum) extract. *Journal of Agricultural and Food Chemistry*, 62(43), 10452-10457.
332. Lawal, I.O., Uzokwe, N.E., Ladipo, D.O., Asinwa, I.O. & Igboanugo, A.B.I. (2009). Ethnophytotherapeutic information for the treatment of high blood pressure among the people of Ilugun, Ilugun area of Ogun State, south-west Nigeria. *African Journal of Pharmacy and Pharmacology*, 3(4), 222-226.
333. Nicoll, R. & Henein, M.Y. (2009). Ginger (*Zingiber officinale* Roscoe): a hot remedy for cardiovascular disease? *International Journal of Cardiology*, 131(3), 408-409.
334. Haniadka, R., Saldanha, E., Sunita, V., Palatty, P.L., Fayad, R. & Baliga, M.S. (2013). A review of the gastroprotective effects of ginger (*Zingiber officinale* Roscoe). *Food and Function*, 4(6), 845-855.
335. Akinyemi, K.O., Oladapo, O., Okwara, C.E., Ibe, C.C. & Fasure, K.A. (2005). Screening of crude extracts of six medicinal plants used in South-West Nigerian unorthodox medicine for anti-methicillin resistant *Staphylococcus aureus* activity. *BMC Complementary and Alternative Medicine*, 5(1), 6-12.
336. Azmir, J., Zaidul, I.S.M., Rahman, M.M., Sharif, K.M., Mohamed, A., Sahena, F., Jahurul, M.H.A., Ghafoor, K., Norulaini, N.A.N. & Omar, A.K.M. (2013). Techniques for extraction of bioactive compounds from plant materials: a review. *Journal of Food Engineering*, 117(4), 426-436.
337. Ferrario, C.M. (2010). New physiological concepts of the renin-angiotensin system from the investigation of precursors and products of angiotensin I metabolism. *Hypertension*, 55(2), 445-452.
338. ARB Trialists Collaboration (2011). Effects of telmisartan, irbesartan, valsartan, candesartan, and losartan on cancers in 15 trials enrolling 138,769 individuals. *Journal of Hypertension*, 29(4), 623-635.
339. Perazella, M.A. & Setaro, J.F. (2003). Renin-angiotensin-aldosterone system: fundamental aspects and clinical implications in renal and cardiovascular disorders. *Journal of Nuclear Cardiology*, 10(2), 184-196
340. Bader, M. & Ganten, D. (2008). Update on tissue renin-angiotensin systems. *Journal of Molecular Medicine*, 86, 615–621.
341. Michel, J.B. (2004). Renin-angiotensin system and vascular remodeling. *Medecine Sciences (Paris),* 20, 409–413.
342. Zhuo, J.L., Ferrao, F.M., Zheng, Y. & Li, X.C. (2013). New frontiers in the intrarenal renin-angiotensin system: A critical review of classical and new paradigms. *Frontiers in Endocrinology (Lausanne),* 4, 166-180.
343. Barton, M. & Yanagisawa, M. (2008). Endothelin: 20 years from discovery to therapy. *Canadian Journal of Physiology and Pharmacology*, 86(8), 485-498.
344. Sriramula, S., Cardinale, J.P., Lazartigues, E. & Francis, J. (2011). ACE2 overexpression in the paraventricular nucleus attenuates angiotensin II-induced hypertension. *Cardiovascular Research,* 92, 401–408.
345. Liu, K.L. (2009). Regulation of renal medullary circulation by the renin-angiotensin system in genetically hypertensive rats. *Clinical and Experimental Pharmacology and Physiology,* 36, 455–461.
346. Danyel, L.A., Schmerler, P., Paulis, L., Unger, T. & Steckelings, U.M. (2013). Impact of AT2-receptor stimulation on vascular biology, kidney function, and blood pressure. *Integrated Blood Pressure Control*, 6, 153-161.
347. Schmaier, A.H. (2003). The kallikrein-kinin and the renin-angiotensin systems have a multilayered

interaction. *American Journal of Physiology-Regulatory, Integrative and Comparative Physiology*, 285(1), R1-R13.

348. Reaves, P.Y., Beck, C.R., Wang, H.W., Raizada, M.K. & Katovich, M.J. (2003). Endothelial-independent prevention of high blood pressure in L-NAME-treated rats by angiotensin II type 1 receptor antisense gene therapy. *Experimental Physiology*, 88(4), 467-473.
349. Bourque, S.L., Davidge, S.T. & Adams, M.A. (2011). The interaction between endothelin-1 and nitric oxide in the vasculature: new perspectives. *American Journal of Physiology-Regulatory, Integrative and Comparative Physiology*, 300(6), R1288-R1295.
350. Alonso, D. & Radomski, M.W. (2003). The nitric oxide-endothelin-1 connection. *Heart Failure Reviews*, 8(1), 107-115.