World Journal of
Pharmacy and Medical Science

ISSN: 3049-3501
Impact Factor: 3.2
CODEN (USA): WJPMAA

Research Article
2025 Volume 1, Issue 4
Page No.: 04-22

TRADITIONAL MEDICINAL PLANTS USED IN GITHUNGURI AREA, KIAMBU COUNTY, KENYA; THE PART OF THE PLANT USED, THEIR PREPARATIONS, AILMENT USED TO TREAT AND A REVIEW ON THEIR PHYTOCHEMICAL COMPOSITION

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Article Received: 07 August 2025 Article Review: 28 August 2025 Article Accepted: 18 September 2025

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DOI: https://doi.org/10.5281/zenodo.17235701

How to cite this Article: Joseph M. Ndegwa and James M. Mbaria (2025). TRADITIONAL MEDICINAL PLANTS USED IN GITHUNGURI AREA, KIAMBU COUNTY, KENYA; THE PART OF THE PLANT USED, THEIR PREPARATIONS, AILMENT USED TO TREAT AND A REVIEW ON THEIR PHYTOCHEMICAL COMPOSITION. World Journal of Pharmacy and Medical Science, 1(4): 04-22. https://doi.org/10.5281/zenodo.17235701

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ABSTRACT

Collection and preservation of ethno-medical information has been given little attention in the modern world due to rapid industrialisation and loss of ethnic culture. Some information on this will definitely get lost. There is, therefore, an immediate need in collection and documentation of information concerning traditional medicine. Hence, a survey on the use of traditional medicine was carried out in Githunguri area, Kiambu County, Kenya followed by a review of their phytochemical composition. A cross-sectional study was used in this study. Study sites were selected using cluster sampling method where villages were used as clusters. 59 respondents were interviewed in all the villages. All the relevant data was collected using a questionnaire which had been developed prior to the study. The data was then analysed using descriptive methods which included the various plants used as traditional medicine, the parts used, how they are prepared and the diseases they are used to treat. The data was then presented in tables, charts and figures. A review of phytochemical composition of these plants was also done. Most people who use traditional medicine in this area are mostly elderly aged above 50 years old (45.76%). The study also revealed that the majority of traditional medicine users are male (55.93%) as compared to their female counterparts (44.07%). Information on traditional medicine has been acquired from parents according to most respondents (44.07%). 61 species of traditional medicinal plants from 37 families were identified. Most of the species came from *Asteraceae* family (13.11%), followed by *solanaceae* family (8.19%). The most widely used plant species is *Prunus Africana* (Hook. f.) Kalkman (69.49%), followed by *Croton megalocarpu*s Hutch. and *Melia azadirachta* L. both of them used at a rate of 52.54%. *Aloe kedongensis* Reynolds is next at a rate of 49.15%. The diseases mostly treated using traditional medicine are malaria (76.27%), gastrointestinal (74.58%) and respiratory diseases (47.46%). The most widely used parts of these plants are leaves (68.85%) and roots (32.79%). Most plant preparations were mostly decoctions (91.80%). There is wide usage of traditional medicine in this area. Information concerning the use of these medicines was documented. However, deforestation is a major challenge affecting their usage. Challenges facing the use of traditional medicine should be addressed by the relevant stakeholders. It was also recommended for more study in order to document more plants that are of medicinal value and to determine the safety and efficacy of these medicines.

KEYWORDS: Ethno-medical, Traditional medicinal plants, Decoctions, Phytochemical.

1. INTRODUCTION

Traditional medicine can also be termed as alternative or complementary medicine meaning that it has been borrowed from another population outside its original culture (Marshall, 1998). Even today, traditional medicine is still being used and nearly 80% of the world's populace depend on it to cater for their everyday well-being needs (Marshall, 1998). This is more so in the third world countries owing to poverty and deficiency of access to modern medication. Medicinal plants in these countries hold an important part in disease management. (Winkler *et al*., 2010).

National Centre for Complementary and Alternative Medicine (NCCAM) of America classifies traditional medicine into five extensive groups. (Wai Fan, 2005). The primary one is alternate therapeutic classifications. These classifications are built upon whole organizations of concept and practice. They evolved ahead of the conventional medicinal approach used in the United States. Examples of these are Homeopathy (Native American Healing practices), Acupuncture, Traditional Chinese medicine, Naturopathic medicine (Tibetan medicine), and Ayurveda.

Mind-Body involvements are the second one. It practises a diversity of methods considered to increase the mind's capability to affect physical function and signs. Examples include Humour therapy, Art therapy, Hypnotherapy, Meditation Biofeedback, Dance therapy, Music therapy, Yoga, Guided imagery and Prayer therapy. However, other practices that were regarded as alternate have turn out to be conventional, for instance, cognitive-behavioural therapy and patient support groups.

Thirdly, is the Biologically- Based Remedies. These are constituents originating from nature, such as vitamins, foods and herbs. It also includes natural but technically undocumented remedies e.g. by means of shark cartilage to treat cancer. The fourth is manipulative and body-based approaches. These are founded on handling and/or manipulation of single or more body parts. Instances include; Alexander Technique, Acupressure, massage therapy, Trager approach, osteopathy, Reflexology, Chiropractic, Therapeutic Touch, Feldenkrais method and Rolfing.

The fifth and the final technique is Energy Remedies. It involves the usage of energy fields. There are two types of them: Bio electromagnetic based therapies and Bio fields. Bio field remedies include usage of energy fields that presumably edge and infiltrate the human body. However, the presence of such fields has until now remained technically unproven. Some bio fields are manipulated by putting pressure and/or working the body by placing the hands in or over these fields. Instances of this consist of Therapeutic touch, Qi gong and Reiki.

Bio electromagnetic founded treatments encompass the alternative use of electromagnetic fields such as magnetic fields, alternating-current or direct-current fields and pulsified fields.

Plants contain substances which are of medicinal value. These substances are often called phytochemicals. There a wide range of them and include steroids, alkaloids, glycosides, tannins, phenols, flavonoids, resins, volatile oils and fixed oils. These are placed in different parts of plant such as roots, bark, fruits, leaves, flowers and seeds (Tonthubthimthong *et al*., 2001).

In East Africa and particularly Kenya, plants have been used in managing various diseases. More than 400 plant types are used as therapeutic plants in East Africa. (Gachati, 1989; kokwaro 1993). However, despite the widespread usage of traditional medication in East Africa, slight work has been done in studying and documentation of this practice. (Jeruto, 2007). Furthermore, rural communities are the utmost abandoned in terms of ethno medicine study. (Prance, 1991).

Githunguri area is one of rural areas in Kiambu county Kenya and like the rest of the country, there is a rise in the usage of traditional medication but little documentation has been done on the same. Hence, this study sought to survey on the general use of traditional remedy in this region; the different remedial plants existing in the area, the various parts of plants used, how they are prepared, the various ailments they are used to treat and a review on their phytochemical structure.

2. MATERIALS AND METHODS

2.1. Study area

Githunguri zone covers approximately 36.6-kilometre squares in Kiambu County, Kenya (Figure 1). The area is predominantly rural. Its physical coordinates are 0° 55' 0" South, 37° 5' 0" east. The zone is mostly covered by high upland volcanic soil. The climate is generally mild warm and temperate (Figure 2). There is significant high rainfall throughout the year. The Koppen –Geiger temperature classification is CFB. The temperature averages 16.9 degrees Celsius and precipitation averages 1380 mm (Figure 3).

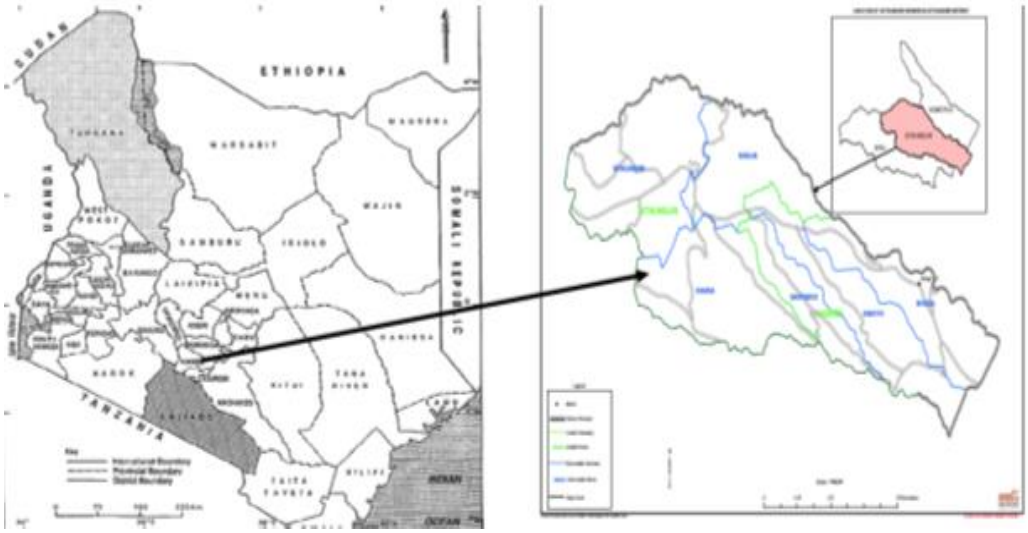

Figure 1: Map of Kenya showing the position of Kiambu County and Githunguri Division respectively (KNBS, 2012).

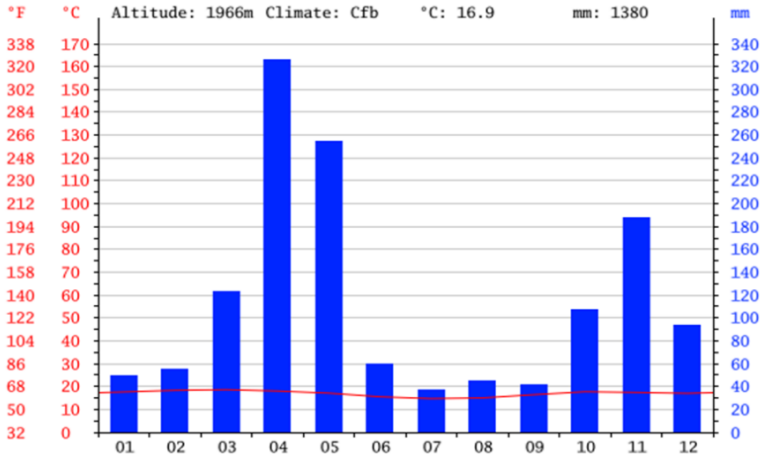

Figure 2: Climate Graph of Githunguri area.

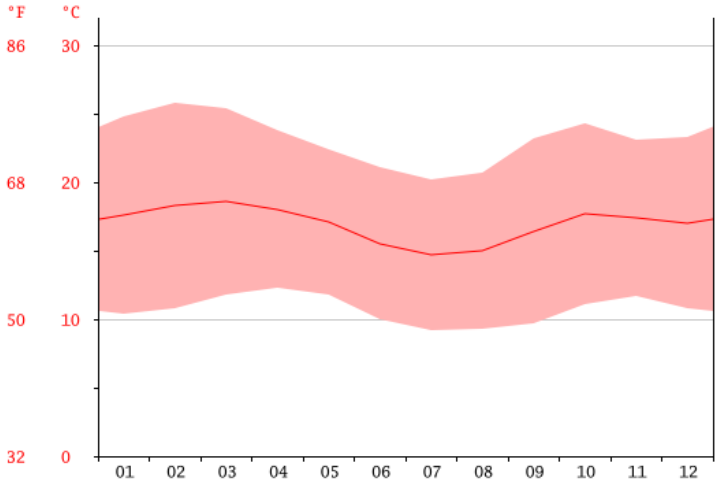

Figure 3: Temperature graph of Githunguri area.

March is the hottest month of the year with an average temperature of 18.6 degrees Celsius. July is the coldest month with an average temperature of 14.7 degrees Celsius

2.2. Study design
A cross-section study was used in this study where the phenomenon investigated was the use of traditional medicine. Things were put as they were without any attempt to change behaviour or condition according to Thomas and Nelson *et al*, 1996 guidelines on a cross-sectional study.

2.3. Targeted populace and study population
The populace of the area is 58, 771 people as per 2009 national census (KNBS, 2010). Targeted populace was all people who used traditional medicine.

2.3.1. Inclusion criteria
Respondents over 18 years who have been using traditional medicine and were willing to participate in the interview were included. These included traditional medicine practitioners and users of this medicine.

2.3.2. Omission criteria
Persons who would otherwise be involved in the exercise but due to one motive or another could not participate due to language barrier or just unwilling to participate.

2.4. Sample size determination
Trial scope of traditional medicine users was reached through calculation by means of the standard method by Kothari, 2003;
$N=z^2pq/d^2$ where;
N= the desired sample size
Z= standard normal deviate 1.96 at 95% confidence interval

The sample size calculation is founded on the supposition that 70% of Kenyans use traditional medication (NCAPD, 2007). Therefore,
P=prevalence of traditional medicine use (0.7)
q=1-p (0.3)
d=1 level of statistical significance, 0.05
Hence, $n= 1.96^2x0.7x (1-0.7)/0.05^2$
$=322.69$
$=323$
Not all 323 who were recruited undertook to participate in the exercise.

2.5. Sampling technique
Study sites were selected using cluster sampling method. Villages were used as clusters. This method was selected since it decreases expenses per interview with a static budget and upsurges effectiveness (Kerry and Bland, 1998) (Figure 4).

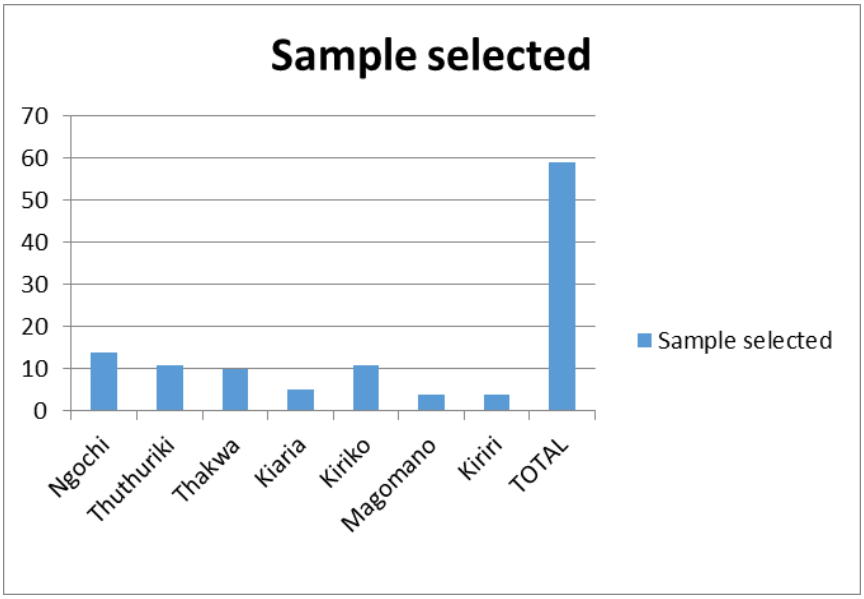

Figure 4: Representative study sites and sample selected.

2.6. Data collection
All respondents who were willing to partake in this research were guaranteed of privacy and the drive of the study, benefits and perils related with the study were explicated to them. A questionnaire was used to collect data. The questionnaire was established through a systemic literature review and discussion with my co-author. The questionnaire consisted of the following parts; age, gender, location of the respondent, the traditional plants they use as medicine, the diseases they treat, the part of the plant used, how these parts are prepared and how the respondent got information regarding use of a certain plant as a medicine.

2.7. Data analysis and presentation
The data was scrutinized by means of descriptive approaches which included the various plants used as traditional medicine, the parts used, how they are prepared and the diseases that elicit use of traditional medicine. Data was presented in tables, charts and figures.

2.8. Statistical analysis

Statistical Package for the Social Sciences (SPSS) software program was employed for this study's data scrutiny. Occurrences for each variable were produced and prepared into tables using SPSS. A chi-square test was used to determine how the independent variables related to demographic characteristics; a P value ≤ 0.05 was considered to be statistically significant.

3. RESULTS

3.1. Demographic characteristics of the participants

Out of 59 respondents, majority of the traditional medicinal plants' users were elderly above 50 years old (45.76%), followed by those of age bracket 41-50 years and those aged 30 years and below. Less users of traditional medicine fall in the category of 31 to 40 years. The findings also show that the majority of traditional medicinal plants users in this area are male (55.93%) compared to their female counterparts (44.07%) (Figure 5).

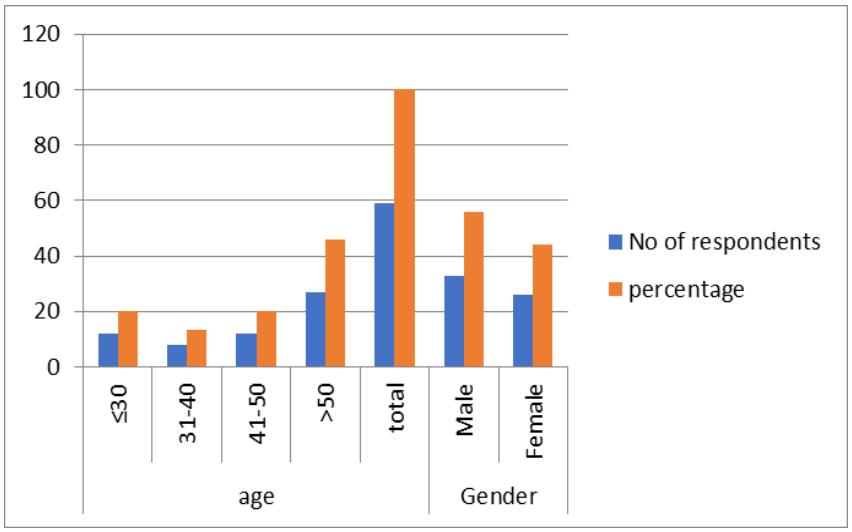

Figure 5: Demographic characteristics of the respondents.

3.3. Sources of information concerning traditional medicine

Most of the information regarding traditional remedy in this area has been passed from parents (44.07%) and from other people (32.20%) (Figure 6).

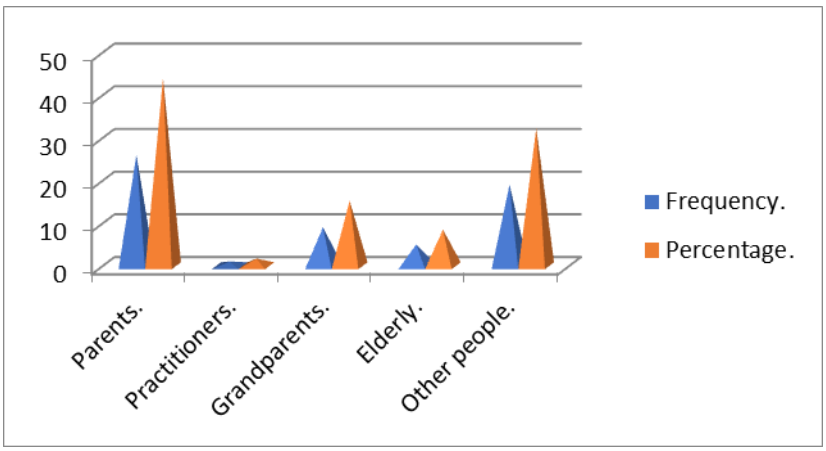

Figure 6: Sources of information concerning traditional medicine.

Table 1: Plants used as medicinal plants, their family name, botanical name, local name, their use, part used, how they are prepared and the number of times mentioned by the respondents.

Family	Botanical name	Local name	Use	Part used	Preparation	Response	Percentage
Amaranthaceae.	*Amaranthus hybridus* Vell.	Terere.	Blood formation.	leaves	Cooking	1	1.69
Anacardiaceae.	*Sclerocarya birrea* [A. Rich.] Hochst.	Mururа.	Abscess.	Leaves.	Poultice and compress	2	3.39
Asteraceae.	*Bidens pilosa* L.	Mucege	Prostate cancer, immune booster, hypertension	Roots, leaves	Decoction, cooking	4	6.78
	Tagetes minuta L.	Mubangi	Wounds, toothache	Leaves	Poultice and compress(wound), sap (toothache)	3	5.08
	Lactuca inermis Forssk.	Muthunga.	Hypertension, constipation	Leaves.	Decoction	3	5.08
	Crassocephalum manii W.J. Baker	Muthakwa wathi	Stomach ulcers, Lumpy Skin Disease (LSD) in cattle, anaplasmosis in cattle	Leaves.	Decoction.	2	3.39
	Conyza florida Steud.	Murunga anake	Arthritis.	Roots.	Decoction.	1	1.69
	Vernonia lasiopus O. Hoffim.	Mocatha.	Malaria, innapetence in cattle	leaves	Decoction.	1	1.69
	Sonchus oleraceus L.	Mahiu.	Hypertension.	Leaves.	Decoction.	1	1.69
	Tithonia diversifolia (Hemsl.) A. Gray	Maruru.	Stomache.	Leaves.	Decoction.	1	1.69
Boragnaceae.	*Cordia abyssinica* Lam.	Muringa.	Hypocalcaemia, blood purification	Leaves, seeds	Eating seeds, leaves powder, decoction.	3	5.08
Brassicaceae.	*Brassica oleracea* L.	Kabichi	Stomach ulcers	leaves	Eating raw	1	1.69
Burceraceae.	*Cammiphora eminii* Engl.	Mukungugu	Toothache.	wood	Decoction.	1	1.69
Caesalpinaceae	*Senna didymobotrya* (Fresen.) H.S. Irwin & Barneby	Mwinu	Malaria, stomache, constipation, amoebosis, internal worms, diarrhea	leaves	Decoction	13	22.03
	Caesalpinia volkensii Harms.	Mucothe	Malaria, arthritis, internal worms, stomache	Bark, leaves, roots, seeds	Decoction	15	25.42
Canellaceae	*Warburgia ugandensis* subsp. *ugandensis*	Muthiga	Toothache, tonsillitis, cold malaria, diarrhea	Wood, leaves, bark	Brushing the teeth with a piece of wood & bark, decoction	6	10.17
Commelinaceae.	*Commelina africana* L.	Mukengeria	Asthma.	Leaves.	Decoction.	3	5.08
Crassulaceae.	*Kalanchoe lanceolata* Pers.	Ihuithia.	Liver disease, edema due to trauma	Leaves.	Infusion (liver disease), steaming near a source of heat (oedema due to trauma)	3	5.08
Cucurbitaceae.	*Cucurbita maxima* Lam.	Marenge	Internal worms	Fruit.	Cooking	1	1.69
	Cucumis aculeatus Cogn.	Kahururа	Antacid for stomach	leaves	Eating raw, juice	1	1.69
Euphorbiaceae	*Croton megalocarpus* Hutch.	Mukindori	Wound, stomache, blood purification, clotting agent, typhoid, cold, arthritis, allergy, malaria,amoebosis,backache	Bark, foliage, roots, leaves	Sap (topical application), decoction	31	52.54
	Croton macronoxylon W. Bull	Mutundu.	Wound, stomache, clotting agent, ringworms malaria, warts	Leaves, bark	Sap, decoction	11	18.64
	Clutia abyssinica Jaub. & Spach	Muthima mburi	Bone ache	roots	Decoction.	1	1.69
Flocourtiaceae.	*Trimeria grandifolia* (Hochst.) Warb.	Mohindahindu.	Malaria, arthritis, stomache	Roots.	Decoction.	2	3.39
Labiatae	*Rosmarinus officinalis* L.	Muthobi	Stomach antacid, sleeplessness, memory loss, cold	leaves	Decoction, sniffing	5	8.47
Lamiaceae	*Plectranthus barbatus* Andrews	Maigoya	Stomach ulcers, stomache, anaplasmosis in cattle, LSD in cattle, diarrhea in human, malaria	leaves	Decoction.	5	8.47
	Ajuga remota Benth.	Wanjiru wa rurii	Malaria, toothache	leaves	Decoction, sap(toothache)	3	5.08
	Leucus calostachyus Oliv.	Mucii.	Arthritis, hypertension, stomache	Leaves.	Decoction.	2	3.39
Lauraceae	*Persea americana* Mill.	Mukorobia	Toothache, stomach ulcers	Seed(toothache), fruit(ulcers)	Eating fruit, roasting the seed and biting with the aching tooth	8	13.56

Leguminaceae	*Acacia mearnsii* De Wild.	Muthanduku	Cough, arthritis, smallpox	Gum(cough), roots(arthritis), bark (small pox)	Chewing(gum), decoction(roots), hot water bath(bark)	5	8.47
	Acacia hockii De Wild.	Mugaa.	Arthritis	Roots.	Decoction.	1	1.69
	Albizia gummifera (J. F. Gmel.) C.A.Sm.	Mukurwe	Internal worms	Bark	Decoction.	1	1.69
Liliciaceae.	*Aloe kedongensis* Reynolds	Mugwanugu	Cold, respiratory infection in chicken, malaria, skin diseases, pneumonia, typhoid, wound, stomache, stomach ulcers, toothache, internal worms, amoebosis, ring worms	leaves	Decoction, maceration, sap on the skin/wound, poultices and compresses, infusion	29	49.15
	Aloe secundiflora Engl.	Kiruma	Malaria, pneumonia, backache, skin diseases, constipation, toothache, cold	leaves	Decoction, infusion, sap on tooth, eating raw	12	20.34
Logamiaceae.	*Strychnos madagascariensis* Spreng. ex Baker	Muteta.	Arthritis.	Bark.	Decoction.	2	3.39
Lythraceae.	*Punica granatum* L.	Kukumanga	Diarrhea, prostate cancer, stomache, stomach ulcers	fruit	Eating fruit.	1	1.69
Marantaceae.	*Colocasia esculenta* (L.) Schott	Nduma	Wound, tonsillitis	Roots(wound), leaves(tonsillitis)	Rubbing cut surface of root on wound, hot steamed leaves on tonsils	3	5.08
Meliaceae.	*Melia azadirachta* L.	Murubaine	Malaria, typhoid, cold, pimples, arthritis, stomache, headache, deworming in sheep, blood purifier, backache	Leaves, bark	Decoction	31	52.54
	Ekebergia capensis Sparrm.	Mununga.	Arthritis.	roots	Decoction.	1	1.69
Moraceae	*Ficus sycomorus* L.	Mukuyu	Toothache.	foliage	Sap on the tooth	4	6.78
Musaceae	*Musa sapientum* L.	Marigu	Stomache, stomach ulcers, clotting agent, Retained afterbirth (RAB) in cattle	Dry banana peelings (stomache), dry bark (stomach ulcers), flower (RAB), sap (clotting agent)	Powder (stomache), decoction (stomach ulcers, RAB), sap on bleeding area	5	8.47
Myrsinaceae.	*Myrsine africana* L.	Ngaita.	Internal worms	Seeds	Decoction.	1	1.69
Myrtaceae.	*Eucalyptus saligna* Sm.	Mubau.	Cough, cold asthma	Leaves, bark, roots	Hot steam bath	8	13.56
	Psidium guajava L.	Mubera.	Diabetes, cough	Leaves	Crushing and maceration	3	5.08
Oleaceae.	*Olea chsofila*	Mutamaiyo.	Internal worms, arthritis	Wood	Decoction.	2	3.39
Papilionaceae	*Erythrina abyssinica* DC.	Muhute	Internal worms, stomache, innappetence	Bark	Decoction	4	6.78
Polygonaceae.	*Emex spinosa* (L.) Campd.	Cong'e	Prostate cancer, stomache	Roots (prostate cancer), leaves (stomache)	Decoction.	1	1.69
	Rumex usambarensis (Engl. ex Dammer) Damer	Mogagatio.	Nerve stimulant.	Tuber.	Decoction.	1	1.69
Rhamnaceaea.	*Rhamnus stellatum*	Mukarakinga.	Arthritis.	Leaves.	Decoction.	1	1.69
Rosaceae.	*Prunus africana* (Hook.f.) Kalkman	Muiri.	Allergy, stomache, arthritis, Prostrate cancer, malaria, urine obstruction, gout, typhoid, amoebosis, back pain, blood purification	Bark, leaves (allergy, prostate cancer), roots, bulb, wood	Decoction, maceration (leaves)	41	69.49
	Rubus apetalus Poir.	Mutare.	Malaria.	Leaves.	Decoction.	1	1.69
Rubiaceae.	*Pentas longiflora* Oliv.	Muhuha	Cold, stomache, nerve stimulant, cough	roots	Decoction	4	6.78
	Coffea arabica L.	Kahua	Arthritis, backache, malaria	roots	Decoction.	3	5.08
	Vangueria domatiosa J. E. Burrows	Mubiru.	Arthritis.	wood	Decoction.	1	1.69
Rutaceacea.	*Zanthoxylum usambarense* (Engl.) Kokwaro	Mugucwa.	Toothache, clotting agent.	Bark.	Sap on tooth or bleeding area	1	1.69
Santalaceae.	*Osyris lanceolata* Hochst. & Steud.	Muthithia.	Diabetes.	Bark.	Decoction.	1	1.69
Solanaceae	*Solanum incanum* Kit. ex Kauitz	Mutongu	Stomache, toothache, tonsillitis	Roots	Decoction, chewing	13	22.03

	Physalis peruviana Mill.	Munathi.	Stomache, malaria, cold, night blindness, amoebosis, diarrhea, ringworms	Leaves, roots, fruit	Decoction, infusion, eating fruits, rubbing leaves against ringworms	12	20.34
	Solanum nigrum Tausch ex Dunal	Managu	Diabetes, blood formation.	Leaves.	Cooking.	2	3.39
	Solanum tuberosum Bertero ex Walp.	Waruu	Wounds, stomach ulcers	Tuber.	Poultice and compress on wound, boiled (stomach ulcers)	1	1.69
	Datura stramonium L. test	Magurukia.	Malaria, backacke, arthritis	Leaves.	Decoction.	1	1.69
Thymaclachiaceae.	*Dodonaea angustifolia* L.f.	Karema muthua	Toothache.	wood	Decoction.	1	1.69
Urticaceae	*Urtica massaica* Mildbr.	Thabai.	Respiratory infections, blood purifier, hypertension, blood formation	leaves	Decoction, infusion, powder	8	13.56

3.5. Plant species used as traditional medicine in the study area

A total of 61 species from 37 families were identified to be used in the study area. Out of this species, majority came from Asteraceae family [8 species (13.11%)], followed by Solanaceae family with 5 species (8.19%). The other families had 3 or 2 or 1 species mentioned (Table 2). The most widely used species in this area is *Prunus Africana* with a usage of 69.49% followed by *croton megalocarpus* and *melia azadirachta* both of them having a usage rate of 52.54%. *Aloe kedongensis* follows with a usage rate of 49.15%.

Table 2: Family and species of plants identified in the study area.

Family	Species	Percentage
Asteraceae	8	13.11
Solanaceae	5	8.19
Euphorbiaceae, lamiaceae, leguminaceae, rubiaceae,	3	4.9
Caesalpinaceae, cucurbitaceae, liliaceae, meliaceae, myrtaceae, papilionaceae, rosaceae	2	3.28
Amaranthaceae, anacardiaceae, boragnaceae, burcerceae, canellaceae, commelinaceae, crassulaceae, lauraceae, logamiaceae, lythraceae, marantaceae, moraceae, musaceae, myrsinaceae, oleaceae, rhamnaceae, rutaceae, santalaceae, thymaclachiaceae, urticaceae	1	1.64

3.6. Diseases that are treated using traditional medicine in the study area

The main disease that elicits use of traditional medicine in this area is malaria with an intervention rate of 76.27% followed by gastrointestinal conditions (74.58%). Respiratory conditions also have a high intervention rate of traditional medicine of 47.46% followed by arthritis and other bone related conditions with an intervention rate of 44.07%. Other conditions that elicited use of traditional medicine include hypertension and other blood related conditions (25.42%), toothache (32.20%), skin conditions (16.95%), wounds (15.25%), prostate cancer (11.86%), typhoid (11.86%), bleeding on cut surface (11.86%), allergy (10.16%), diabetes (5.08%), and urinary conditions (3.39%) (Figure 7). Also, apart from human conditions eliciting herbal intervention, some animal conditions also call for traditional medicine intervention with an intervention rate of 15.25%.

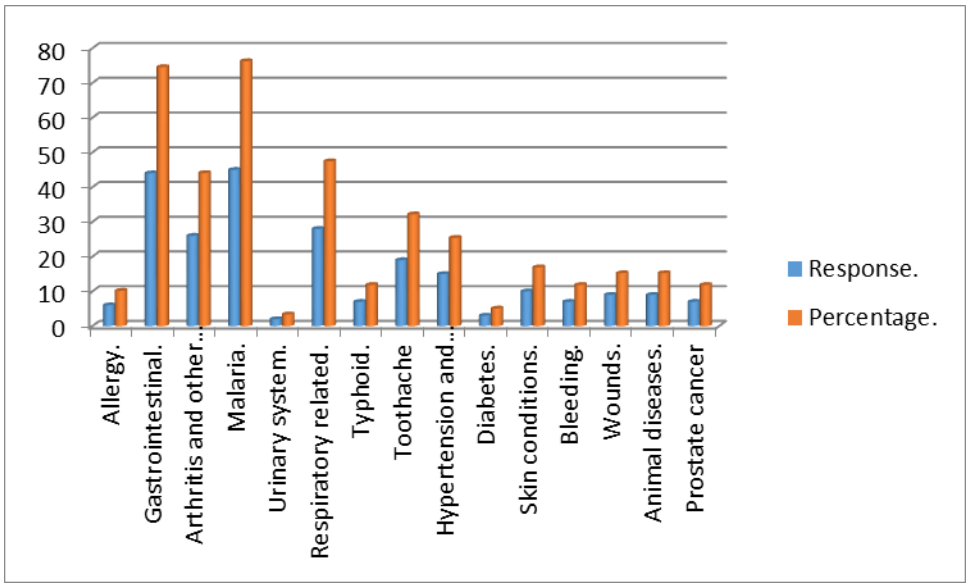

Figure 7: Diseases that elicit use of traditional medicine.

3.7. Parts of plants used for medicine in the study area

Out of the 61 species of medicinal plants identified in the study area, the main part used is leaves with a usage rate of 68.85%, followed by roots (32.79%), bark (24.59%), wood (9.84%), fruits and seeds (6.56%), tuber (3.28%), and gum and flower both at 1.64% (Figure 8). However, majority of plants had various parts that are used as medicine. For instance, in *Prunus africana*, the bark leaves and wood can be used as medicine for various diseases.

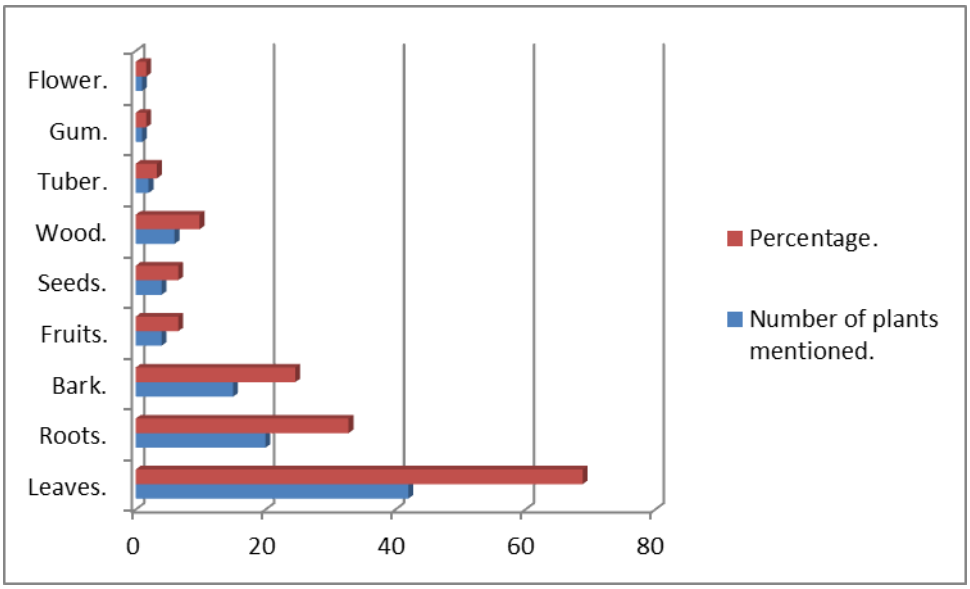

Figure 8: Parts of plants used as medicine.

3.8. How various plants are prepared for medicine in the study area?

Nearly all the plants identified in this study area were prepared through decoctions (91.80%). Sap was obtained in quiet a number of plants (16.39%), and used as medicine. Cooking, eating raw, infusion, chewing, and other methods accounted for 8.2%. Powder, poultices and compresses and macerations accounted for 4.92%. Steaming on heat and hot water and vapour baths accounted for 3.28% (Figure 9).

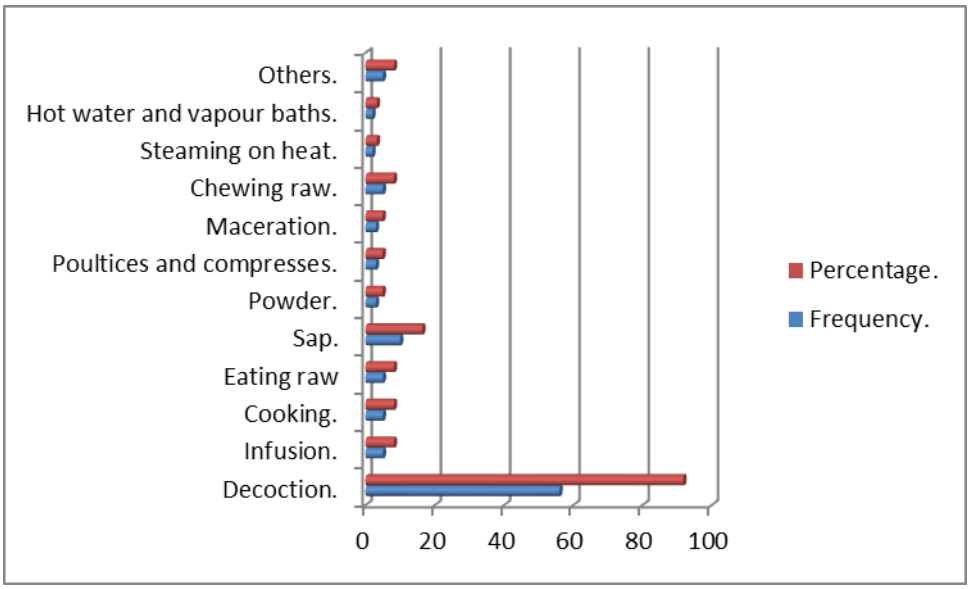

Figure 9: Various plant preparations in the study area.

3.9. Medicinal plants that are of veterinary importance in the study area

Not only the medicinal plants identified in the study area are used to treat human diseases but some are also used to treat animal diseases. For instance, *Melia azadirachta*, from *Meliciae* family can be used in deworming of sheep, the flower of *Musa sapientum* species from *musaceae* family can be used in cows with retained afterbirths (RAB), *Plectrathus barbetus* from *Lamiaceae* family has properties against anaplasmosis and lumpy

skin disease in cattle. *Crassacephalum manii* from the family *Asteraceae* is also used against lumpy skin disease and anaplasmosis in cattle (Table 3).

Table 3: Medicinal plants that are of veterinary importance.

Family	Species	Local name	Disease	Part used	Preparation
Meliaceae	*Melia azadirachta*	Murabaini	Deworming in sheep	Leaves	Decoction
Musaceae	*Musa sapientum*	Marigu	Retained afterbirth (RAB) cows	Flower	Decoction
Lamiaceae	*Plectranthus barbetus*	Maigoya	Anaplasmosis and lumpy skin disease (LSD) in cattle	Leaves	Decoction
Asteraceae	*Crassacephalum manii*	Muthakwa wathi	LSD and anaplasmosis in cattle	Leaves	Decoction

3.10. Phytochemical composition of traditional medicinal plants used in the study area.

Botanical name	Local name	Phytochemical composition	Reference
Amaranthus hybridus	Terere	steroids (including cardenolids), terpenoids (i.e., triterpenes, carotenoids, and iridoïds), saponins, betalains, tannins, flavonoids, and polyphenols	Nana *et al*., 2012
Sclerocarya birrea	Murura	hydroxyl-methoxyphenyl-*O*-galloyl glucopyranoside, trihydroxystilbene glucosyl-*O*-gallate, dimethoxy-hydroxyphenyl-*O*-galloyl glucopyranoside and galloyl-glucosyl dihydroxymethoxyacetophenone, catechin and epicatechin, procyanidin B-type isomers, flavanols, flavanones, flavanonols, and chalcones, hydroxylbenzoic acids derivatives, homaloside D, ellagic acid, quinic acid, lyoniside, pentamethoxystilbene, nonanedioic acid	Cádiz-Gurrea *et al*., 2019
Bidens pilosa	Mucege	Alkaloids, Reducing sugars, Phenols, Flavonoids, Tannins, Saponins	Ruiz-Reyes *et al*., 2022
Tagetes minuta	Mubangi	m-tert-butyl-Phenol, β-Ocimene, spathulenol, 2,6-dimethyl-, (E)-5,7-Octadien-4-one, 1,2,3,4,4a,5,6,7-octa hydro-4a-methyl-naphthalene	Igwaran *et al*., 2017
Lactuca inermis	Muthunga	Scopoline, syringic acid, 4- hydroxyphenylacetic acid, ixerin F 9a-hydroxyzaluzanin C, 11b,13-dihydroglucozaluzanin C, a-xylofuranosyluracil, isofraxoside	Michalska *et al*., 2014
Crassocephalum manii	Muthakwa wathi	Tannins, Saponins, Phenolics, Terpenoids, Steroids	Magadula *et al*., 2011
Conyza floribunda.	Murunga anake	24-ethylcholesta-5, 22E, cyasterone, 25-triene 3-O-β-glucoside (1"→ 4') rhamnoside, 24-ethylcholesta-5, 22E, 25-triene 3-O-β-glucoside, stigmasta-5, 22-dien-3-acetate, stigmasta-5, 22-dien-3-ol, spinasta-7, 22-dien-3-o, 3-oxofriedooleanane, 3-hydroxfriedooleanane, 3-acetoxyfriedooleanane, betulinic acid, quercetin 3-O-β-glucoside, quercetin, myricetin, kaempferol	Manguro *et al*., 2010
Vernonia lasiopus	Mocatha	Flavonoids, Phenols, Saponins, Alkaloids, Terpenoids	Muthoni *et al*., 2020
Sonchus oleraceus	Mahiu	sesquiterpene lactones of the eudesmanolides and guaianolide structures, flavonoids, proanthocyanidins, flavonols, saponins, total phenols, alkaloids, vitamin C fatty acids, oxalic acid, carotenoids	Puri *et al*., 2018.
Tithonia diversifolia	Maruru	alkaloids, saponins, flavonoids, phenols, terpenoids, tannins, Sesquiterpenes, manganese, copper zinc, nickel, iron, magnesium, sulphur and phosphorous	Ajao *et al*., 2017
Cordia abyssinica.	Muringa	Quinones, Triterpenoids, Diterpenoids, Sesquiterpenes, Monoterpenes, Steroids, Saponins, Flavonoids, Lignans and neolignans, Phenylpropanoid, phenolics, Porphyrins and	Oza *et al*., 2017

		coumarins, Alkaloids, Carotenoids, Essential oil, Fatty acids	
Brassica oleracea	Kabichi	phenolics, carotenoids, flavonoids, ascorbic acid (Vit. C) glucosinolates, and tocopherols.	Nawaz *et al*., 2018
Cammiphora eminii	Mukungugu	terpenoids (monoterpenoids, sesquiterpenoids, and volatile/essential oil), heerabolene, elemol, acadinene, cuminaldehyde, eugenol, multitude of furano-sesquiterpenes, including furanodienone, furanodiene, curzerenone, and lindestrene, 2-methoxyfuranodiene and 2-acetoxyfuranodiene, diterpenoids, triterpenoids, and steroids	Batiha *et al*., 2022
Senna dichymobotrya	Mwinu	steroids, saponins, terpenoids, tannins, anthraquinones, flavonoids, glycosides, phenols and alkaloids	Nyamwamu *et al*., 2015
Caesalpinia volkensii	Mucothe	Sterols, Anthroquinones, Terpenoids, Flavanoids, Taninnis, phenols, saponins, Alkaloids and Chalcones	Ndile *et al*., 2018
Warubigia ugandensis	Muthiga	Sesquiterpenes (mukaadial, muzigadial, muzigadiolide, warburganal, warbugin, warburgiadione, ugandensidial (cinnamodial), ugandenial A, isopolygodial (isotadeonal), polygodial cinnamolide, cinnamolide-3–acetat, salutar isolide, deacetylugandensolide, 11α-hydroxymuzigadiolide, mannitol, pereniporin B, drimenol, drimenin, and dendocarbins A, L and M), alkaloids, Flavonoids, phenolics, sugar alcohols, and unsaturated fatty acid including linoleic acid	Dharani *et al*., 2020
Commelina africana	Mukengeria	Alkaloids, Saponins, Tannins and Cardenolides	Agunbiade *et al*., 2012
Kalonche laceolata	Ihuithia	triterpenes, alkaloids, glycosides, steroids, flavonoids, bufadienolides, lipids and organic acid, flavonol glycosides, phenylpropanoids, benzoic acid derived compounds, gallic acid derivatives, proanthocyanidins, acyclic alcohol glycosides	Pattewar *et al*., 2012 Stefanowicz-Hajduk *et al*., 2023
Cucurbita maxima	Marenge	flavonoids, alkaloids, polyphenols, proteins, carbohydrates, terpenoids, saponins, glycosides	Muya *et al*., 2018
Cucurmis aculeatus	Kahurura	Terpenoids, phenolics, Anthraquinones, Alkaloids	Ogutu *et al*., 2012
Croton megalocarpus	Mukindori	flavones, alkaloids, flavonoids, sterols, glycosides, reducing sugars, β-sitosterol, saponins, tannins and terpenoids, clerodane diterpenoids, namely chiromodine and epoxy-chiromodine, betulin, lupeol, 3-β-O-acetoacetyllupeol, O-acetylaleuritolic acid and E-ferulic acid	Alfred *et al*., 2017
Croton macronoxylon	Mutundu	alkaloids, flavonoids, terpenoids, and essential oils containing mono and sesquiterpenes	El-Shaibany *et al*., 2023
Clutia abyssinica	Muthima mburi	5-methylcoumarins and diterpenes, Volatile oils such as γ-cadinene, β-ionone, α farnesene and farnesylacetone, anthraquinones, alkaloids, cardiac glycosides, phenolics, flavonoids, saponins, tannins, steroids and terpernoid	Maroyi *et al*., 2020
Trimeria grandifolia	Mohindahindu	Idesin, Lupenone, Sitosterol, friedelanol,	Charles *et al*., 2011
Rosimarinus officinalis	Muthobi	Coniferyl alcohol, Podolide, Rosmanol, (Epi)(iso)rosmanol I, (Epi)(iso)rosmanol II, Lariciresinol, Rosmadial, (Epi)rosmanol methyl ether, Carnosol, Rosmadial isomer, Rosmaridiphenol, Carnosic acid, Rosmaridiphenol isomer I, Rosmaridiphenol isomer II, Carnosol isomer, Asiatic acid, 12-O-methylcarnosic acid, Carnosic acid	Ibrahim *et al*., 2022

		isomer, betulinic acid, Lanopalmitic acid, Oleanolic acid, Ursolic acid, Augustic acid, Pyro-pheophytin-b	
Plectranthus barbatus	Maigoya	Diterpenoids and essential oil.	Alasbahi *et al*., 2010
Ajuga remota	Wanjiru wa rurii	neo-clerodane diterpenoids (e.g. ajugarin-I), phytoecdysteroids (phytoecdysones, e.g. 20-hydroxyecdysone), iridoid glycosides (e.g. 8-O-acetylharpagide), flavonol glycosides and ergosterol-5,8-endoperoxide	Cocquyt *et al*., 2011
Leucus colostachyus	Mucii	Glycosides, terpenoids, phenolic compounds, flavonoids, steroids, fatty acids, alkaloids, coumarins, saponins, tannins	Sachin *et al*., 2023
Persea americana	Mukorobia	Kaempferol, apigenin and isorhamentin glycosides, Anthocyanins and catechin, saturated and unsaturated fatty acids i.e., Palmitoleic acid, linolenic acid, linoleic acid, Stearic acid, Oleic acid, Avenasterol, Cycloartenol, Campasterol, ɣ- Tocopherol, Palmitic acid, α- Tocopherol,	Abd Elkader *et al*., 2021
Acacia mearnsii	Muthanduku	gallic acid, phenolic, procyanidin, proanthocyanidins, flavonoid.	Jia Xionga *et al*., 2016
Acacia hockii	Mugaa	alkaloids, phenols, saponins, sterols, terpenoids, polysaccharides, fatty acids, nonprotein amino acids	Nusrat *et al*., 2018
Albizia gummifera	Mukurwe	Vitalboside-A, vitalboside-A, 2'- methylglucuronate 3-O-{β-D-glucopyranosyl(142)-[α-L-arabinopyranosyl(146)]-β-D-glucopyranosyl}-oleanolic acid	Karuppannan *et al*., 2013
Aloe kedongensis	Mugwanugu	polysaccharides, carbohydrates, coumarins, flavonoids, tannins, anthraquinones, chromones, pyrones, alkaloids, organic compounds, phytosterols, anthrones, sterols, proteins, vitamins, and mineral constituent	Nalimu *et al*., 2021
Aloe secundiflora	Kiruma	aloenin B, aloenin, isobarbaloin (aloin B), aloinside A, barbaloin (aloin A), aloesin derivative, aloinside B	Salehi *et al*., 2018
Strychnos madagascariensis	Muteta	2-Acetoxy-5 hydroxyacetophenone, a-Dnp-L-arginine, Alkaloids, Benzenepropanoic acid, Butanoic acid, C-toxiferine I, Cardiac glycosides, Cyclo (leucyloprolyl), Cyclotene, dl-Alanine ethyl ester, Ethylene acetal, Flavonoids, Furaneol, Furfuryl alcohol, Hydratropaldehyde, Methoxy-phenyl-oxime, Methylcyclopentenolone, Pyrazole, Quinoline, Saponins, Silicon tetrafluoride, Steroids, Strychnine, Styrene glycol, Tannins, Terpenoids, Trifluoromethylcinnamic acid, Triterpenoids, Vinyl acrylate	Maroy *et al*., 2021
Punica granatum	Kukumanga	Chlorogenic acid, Gallic acid, Catechin, Coumaric acid, Caffeic acid, Rutin, Epicatechin	Hamrita *et al*., 2022
Colocasia esculanta	Nduma	Flavonoids, Anthraquinone, Terpenoid, Phenols, Alkaloid, Saponin, Thiamine, Riboflavin, Apigenin, Luteolin, Anthocyanin, Cyanidine 3-glucoside	Jain *et al*., 2023
Melia azadirachta	Murubaine	Steroid, Alkaloids, Phenols, Flavonoid, Saponin, Tannins, Anthraquinones , Amino acids	Jeba *et al*., 2020
Ekebergia capensis	Mununga	triterpenoids, Limonoids, coumarins, alkaloids, steroids, phenolic compounds, stilbenes	Kemayou *et al*., 2021
Ficus sycomorus	Mukuyu	tannins, phenols, flavonoids, triterpenes, quninous, coumarins, alkaloids, saponins, resins, glycosides, steroids, reducing sugars	Earnest *et al*., 2018
Musa sapientum	Marigu	Catecholamines such as norepinephrine, serotonin, Dopamine; Tryptophan, indole compounds, pectin,	Mahadeva *et al*., 2014

		flavonoids and related compounds (Leucocyanidin, quercetin and its 3-Ogalactoside, 3-O-glucoside, and 3-O-rhamnosyl glucoside), tannin, starch, iron, crystallisable and non-crystallisable sugars, vitamin C, B-vitamins, albuminoids, fats, mineral salts, Cellulose, hemicelluloses, arginine, aspartic acid, glutamic acid, leucine, valine, phenylalanine and threonine, Hemiterpenoid glucoside (1,1-dimethylallylalcohol), syringin, (6S, 9R)-roseoside, benzyl alcohol glucoside, (24R)-4α, l4 α,24-trimethyl-Sacholesta-8,25(27) dien-3β-o1	
Myrsine. africana	Ngaita	steroids, terpenoids, flavonoids, tannins and saponins, carbohydrates, phenolics and alkaloids	Laraib *et al*., 2020
Eucalyptus saligna	Mubau	α-pinene, 1,8-cineole, *o*-cimene, α-terpineol	Barbosa *et al*., 2016
Psidium guajava	Mubera	vitamin A, C, iron, phosphorus and calcium, saponin, oleanolic acid, lyxopyranoside, arabopyranoside, guaijavarin, quercetin and flavonoids, terpenes, caryophyllene oxide and p-selinene, Guajadial, α-pinene, limonene, β-pinene, isopropyl alcohol, menthol, terpenyl acetate, caryophyllene, longicyclene and β-bisabolene, Oleanolic acid, limonene, caryophyllene, Leukocyanidins, gallic acid and sterols, Tannic acid	Naseer *et al*., 2018
Olea chsofila	Mutamaiyo	Not available	
Erythrina abyssinica	Muhute	Tannins, saponins, alkaloids, and flavonoids, terpenoids, cardiac glycosides, coumarins, and anthraquinone derivatives	Samuel *et al*., 2021
Emex spinosa	Cong'e	Carbohydrates, Phlobatannins, Phytosterol, Alkaloids, Flavonoids, Steroids and Terpenoids, Tannins, Glycosides, Protein	Ajaib *et al*., 2022
Rumex usambarensis	Mogagatio	naphthalenes, flavonoids, anthraquinones, stilbenoids, phenolic acids, carotenoids, oxalic acid, triterpenes	Vasas *et al*., 2015
Rhamnus stellatum	Mukarakinga	flavonoids, anthraquinones, naphthalene derivatives, steroids, terpenoids, alkaloids, organic acids	Nigussie *et al*., 2021
Prunus africana	Muiri	Atraric acid, Ferulic acid, Lauric acid, Myristic acid, N-butylbenzene-sulfonamide, Oleanolic acid, Ursolic acid, β-amyrin, β-sitosterol, Flavonols, Terpenoids, Tannins	Komakech *et al*., 2019
Rubus apetalus	Mutare	Alkaloids, Saponins, Flavonoids, Phytosterols & triterpenoids, Phenolics & tannins,	Raghavendra *et al*., 2018
Pentas longiflora	Muhuha	naphthoquinones, simple phenolic compounds, napthohydroquinones, anthraquinones, and iridoids, alkaloids, triterpenes, sterols, and chromenes	Sweelam *et al*., 2017
Coffea Arabica.	Kahua	Syringic acid, Chlorogenic acid, Ferulic acid, Hydroxybenzoic acid, Protocatechuic acid, Trigonelline Caffeine, Theophylline, Caffeic acid	Affonso *et al*., 2016
Vangueria domatiosa.	Mubiru	Carbohydrates, proanthocyanidins, Vitamin E, Alcohol, Cyclitol, Flavonoid, Coumarin, Phenolics, Monomethyl ester, Fatty acids, Sterols,	Maroyi *et al*., 2018
Zanthoxylum usambarense	Mugucwa	flavonoids, terpenes, coumarins, phenolic acids, and alkaloids, Lignans, Amides, fatty acids, Phytosterols and their derivatives, tannins, phenol and phenolic acids, phenylpropanoids and steroid	Okagu *et al*., 2021
Osyris lanceolata.	Muthithia.	hexyl and hexenyl derivatives, sesquiterpenes, longchain hydrocarbons, and fattyacids, triterpenes, dihydro-β agarofuran sesquiterpenes, flavonoids,	Shyaula *et al*., 2012

		phenolic acids and phenyl propanoids, pyrrolizidine and quinolizidine alkaloids, norisoprenoids, lignans, and β-carboline alkaloids	
Solanum incanum	Mutongu	steroids, alkaloids, cardiac glycosides, tannins, cyanogenic glycosides, flavonoids, oxalates and saponins	Sambo *et al*., 2016
Physalis peruviana	Munathi.	minerals (K, Mg, Ca, Fe, P, Na, Zn, Cu, Mn), vitamins (A, B, C, E, K1), carotenoids, carbohydrates, fatty acids and phytosterols, flavonoids and phenolic acids, alkaloids, protein	Popova *et al*., 2020
Solanum nigram	Managu	cardiac glycosides, phenols, quinines, saponins and steroids, coumarin, terpenoids, Anthraquinone glycosides, Flavonoids, Glycosides, Tannins	Sabu *et al*., 2018
Solanum tuberosum	Waruu	Phenolic acids, Flavonoids, Alkaloids,	Basalingappa *et al*., 2021
Datura stramonium.	Magurukia.	Alkaloids (hyoscyamine and hyoscine (scopolamine)), protein albumin and atropine, Ditiglyol esters of 3,6-dihydroxytropane and 3,6,7-trihydroxytropane, tropine and pseudotropin, 6-hydroxyhyoscymine, skimmianine, metelodine, acetyl derivatives of caffeic, p-coumaric and ferulic acid, stigmasterol, campesterol, with anolide I, steroidal glycosides, daturataturins A and B, flavonoids, chrysins, quercetin and their esters, Withastramonolide and coumarins (umbelliferon and scopolin)	Mukherjee *et al*., 2013
Dodonaea angustifolia.	Karema muthua	anthraquinones, alkaloids, glycosides, phenolics, essential oils, saponins and terpenoids, Steroids, Tannins, Flavonoids	Fisseha *et al*., 2018
Urtica mossaica	Thabai.	Phenolic acids, Flavonoids, Amino acids, Organic acids, Fatty acids, Carotenoids	Devkota *et al*., 2022

4. DISCUSSION

Most of traditional medicine users in this area are elderly above 50 years old (45.76%). This is in line with a study done by Kelly *et al*, 2005. Most of the information concerning traditional medicine in this area has been passed from parents (44.07%) and from other people (32.20%) similar to a study done by Ahmed *et al*., 2023. The most frequently used plant family in this area is *Asteraceae* family. This may be due to high number of species in this family (19,085). Similar findings were made by Bennett and Prance *et al*, 2000. These plants are usually herbs and occur as weeds. They are readily available in many areas (Voeks, 1996). According to Stepp and Moerman *et al*, 2001, these plants concentrate very active biological components as a function of their habit and their adaptations for survival. It has also been found out that many communities all over the world use traditional medicines based on their chemical composition and their ecological characteristics (Stepp *et al*, 2004).

The most widely used species in this area is *Prunus Africana* with a usage rate of 69.49%. This is in contrast to a study done by Kigen *et al*., 2017, in which the most commonly used plant species in Sangurur, Elgeyo Marakwet County, Kenya was *Rotala tenella*. This could be due to different climatic conditions in which these two species of plants occur.

The main disease that elicits use of traditional medicine in this area is malaria with an intervention rate of 76.27% followed by gastrointestinal conditions (74.58%). This is comparable to a study done by Kareru *et al*., 2007, in which malaria was identified as the most common disease that elicited use of herbal medicine. This is also nearly similar to a study conducted in Iran among infertile patients where 33.3% of herbal medicine were mainly used in treating gastrointestinal diseases (Kashani *et al*., 2013).

This study revealed that leaves were the most commonly used part of all the plant species used in this area (68.85%). Similar findings had been made in communities where vegetation is always green (Di stasi *et al*, 2002). Vast use of leaves could also be due to the fact that leaves are the main photosynthetic organs in plants and that the phytosynthates are translocated to other parts of the plants much later. Hence, they act as reservoirs for many phytosynthates many of which are of medicinal value (Balick and Cox *et al*, 1996).

Most of diseases prevalent in this area are malaria and respiratory related conditions like pneumonia and colds. This could be due to the fact that this is a cold place with high rainfall throughout the year. Most of the plant preparations were mainly decoctions. This is similar to a study done in Samburu, Kenya by James Mbaria *et al*

and Mark Nanyinyi *et al* where hot and cold decoctions were the major preparations.

Medicinal plant species from four families including *Meliciae, Musaceae, Lamiaceae* and *Asteraceae* families were identified to be of veterinary importance. This is similar to a study conducted by Grace *et al*., 2006. Livestock diseases which included anaplasmosis, helminthiasis and skin conditions elicited use of traditional medicine similar to a study done by Gakuubi *et al*., 2012.

1. CONCLUSIONS AND RECOMMENDATIONS

It is evident that there is prevalence on the use of traditional medicine in Githunguri area of Kiambu County. This is a reflection of the continued use of traditional medicine all over the world even in this era where conventional medicine is so prevalent. More study should be undertaken to determine the continued trust in these medicines among the people. Plant species which had not been documented in this area have been documented in this area. There is an urgent need to document the various plant species used all over the world as traditional medicine in order to help preserve this vital information. This is also necessary because of the various challenges facing the use of these medicines like high rate of urbanisation in rural areas and deforestation. This information will help come up with various remedies for various diseases especially in the pharmaceutical industry. It will be much easier to carry out phytochemical screening on plants that has been documented to be used in traditional medicine rather than doing trial and error on a plant whose medicinal value is not known. This will help eliminate high costs and much time which is associated with this. Further study should also be carried to determine the level of efficacy and safety among these medicines

Credit authorship contribution statement

Joseph M. Ndegwa: conceptualization, investigation, writing-original draft, methodology, validation, visualization, writing-review and editing, formal analysis, data curation, software, project administration, resources. **James M. Mbaria**: conceptualization, methodology, supervision, visualization, validation, project administration.

Declaration of competing interest

The author has no conflict of interest to declare

Data availability statement

Data used to support the findings of this study is available upon request

ACKNOWLEDGEMENT

I would like to acknowledge the University of Nairobi for facilitating this study.

REFERENCES

1. A.A. Ajao, A.N. Moteetee, Tithonia diversifolia (Hemsl) A. Gray. (Asteraceae: Heliantheae), an invasive plant of significant ethnopharmacological importance: A review, South African Journal of Botany, 2017; 113: 396-403. ISSN 0254-6299, https://doi.org/10.1016/j.sajb.2017.09.017
2. Abd Elkader AM, Labib S, Taha TF, Althobaiti F, Aldhahrani A, Salem HM, Saad A, Ibrahim FM, Phytogenic compounds from avocado (Persea americana L.) extracts; antioxidant activity, amylase inhibitory activity, therapeutic potential of type 2 diabetes, Saudi J Biol Sci, 2022; 29(3): 1428-1433. doi: 10.1016/j.sjbs.2021.11.031. Epub 2021 Nov 24. PMID: 35280591; PMCID: PMC8913550.
3. Affonso RC, Voytena AP, Fanan S, Pitz H, Coelho DS, Horstmann AL, Pereira A, Uarrota VG, Hillmann MC, Varela LA, Ribeiro-do-Valle RM, Maraschin M, Phytochemical Composition, Antioxidant Activity, and the Effect of the Aqueous Extract of Coffee (Coffea arabica L.) Bean Residual Press Cake on the Skin Wound Healing, Oxid Med Cell Longev, 2016; 2016: 1923754. doi: 10.1155/2016/1923754. Epub 2016 Nov 14. PMID: 27965732; PMCID: PMC5124758.
4. Agunbiade OS, Ojezele OM, Ojezele JO, Ajayi AY, Hypoglycaemic activity of Commelina africana and Ageratum conyzoides in relation to their mineral composition, Afr Health Sci, 2012; 12(2): 198-203. doi: 10.4314/ahs.v12i2.19. PMID: 23056028; PMCID: PMC3462550.
5. Ahmed GEM, Ahmed EYM, Ahmed AE, Hemmeda L, Birier AB, Abdelgadir T, Hassan HMA, Alfadul ESA, Bakr M, Sadig E, Prevalence and reasons to seek traditional healing methods among residents of two localities in North Kordofan State, Sudan 2022: A cross-sectional study, Health Sci Rep, 2023; 6(8): e1487. doi: 10.1002/hsr2.1487. PMID: 37621385; PMCID: PMC10444970.
6. Ajaib M, Ishtiaq S, Ishtiaq M, Maqbool M, Bhatti KH, Khan A, Afreen A, Hussain T, Sardar T, Gul A, Azeem M, Analysis of antidiabetic, antiulcer and analgesic potential of traditional ethnomedicinal plant Emex spinosa (L.) Campd. from Azad Jammu and Kashmir, PLoS One, 2022; 17(10): e0274706. doi: 10.1371/journal.pone.0274706. PMID: 36227949; PMCID: PMC9560475.
7. Alasbahi RH, Melzig MF, Plectranthus barbatus: a review of phytochemistry, ethnobotanical uses and pharmacology - Part 1, Planta Med, 2010; 76(7): 653-661. doi: 10.1055/s-0029-1240898. Epub 2010 Feb 22. PMID: 20178070.
8. Alfred Maroyi, Croton megalocarpus Hutch. in Tropical Africa: Phytochemistry, Pharmacology and Medicinal Potential, Research Journal of Medicinal Plants, 2017; 11: 124-133.
9. Balick M, Cox P, Plants, Culture and People, Scientific American, 1996; New York.
10. Barbosa LC, Filomeno CA, Teixeira RR, Chemical Variability and Biological Activities of Eucalyptus

spp. Essential Oils, Molecules, 2016; 21(12): 1671. doi: 10.3390/molecules21121671. PMID: 27941612; PMCID: PMC6273930.
11. Basalingappa K, Bm K, Solanum tuberosum L: Botanical, Phytochemical, Pharmacological and Nutritional Significance, International Journal of Phytomedicine, 2019; 10: 115-124. doi: 10.5138/09750185.2256.
12. Batiha GE, Wasef L, Teibo JO, Shaheen HM, Zakariya AM, Akinfe OA, Teibo TKA, Al-Kuraishy HM, Al-Garbee AI, Alexiou A, Papadakis M, Commiphora myrrh: a phytochemical and pharmacological update, Naunyn Schmiedebergs Arch Pharmacol, 2023; 396(3): 405-420. doi: 10.1007/s00210-022-02325-0. Epub 2022 Nov 18. PMID: 36399185; PMCID: PMC9672555.
13. Bennett BC, Prance GT, Introduced plants in the indigenous pharmacopoeia of northern South America, Economic Botany, 2000; 54: 90-102.
14. Cádiz-Gurrea ML, Lozano-Sánchez J, Fernández-Ochoa Á, Segura-Carretero A, Enhancing the Yield of Bioactive Compounds from Sclerocarya birrea Bark by Green Extraction Approaches, Molecules, 2019; 24(5): 966. doi: 10.3390/molecules24050966. PMID: 30857290; PMCID: PMC6429519.
15. Charles Onyango Omollo, The Anti-malarial and Biochemical Studies of Microglossa pyrifolia (Lam.) Ktze and Trimeria grandifolia (Hochst.) Warb from Lake Victoria Basin, Kenya, 2011.
16. Devkota HP, Paudel KR, Khanal S, Baral A, Panth N, Adhikari-Devkota A, Jha NK, Das N, Singh SK, Chellappan DK, Dua K, Hansbro PM, Stinging Nettle (Urtica dioica L.): Nutritional Composition, Bioactive Compounds, and Food Functional Properties, Molecules, 2022; 27(16): 5219. doi: 10.3390/molecules27165219. PMID: 36014458; PMCID: PMC9413031.
17. Dharani N, A review of Phytochemical Constituents and Pharmacological Activities of Ethnomedicinal Warburgia ugandensis Sprague ssp. ugandensis in East Africa, 2020; 24: 67-71.
18. Di Stasi LC, Oliveira GP, Carvalhaes MA, Queiroz-Junior M, Tien OS, Kakinami SH, Reis MS, Medicinal plants popularly used in the Brazilian Tropical Atlantic Forest, Fitoterapia, 2002; 73: 69–91.
19. Earnest E, Ilodigwe E, Ihekwereme C, Ficus Sycomorus L (Moraceae): A review on its Phytopharmacology and toxicity profile, Discovery Phytomedicine, 2018; 5: 64. doi: 10.15562/phytomedicine.2018.75.
20. El-Shaibany A, Alhakami I, Humaid A, Elasser M, A REVIEW ARTICLE OF PHYTOCHEMICAL CONSTITUTIONS OF CROTON GENUS, European Journal of Pharmaceutical and Medical Research, 2023; 9: 15.
21. Fisseha S, Saphan C, Abraha T, Phytochemical analysis of Dodonaea angustifolia plant extracts, 2018; 6: 37-42.
22. Gachati FN, Kikuyu Botanical Dictionary of plant names and uses, 1989.
23. Gakuubi MM, Wanzala W, A survey of plants and plant products traditionally used in livestock health management in Buuri district, Meru County, Kenya, J Ethnobiology Ethnomedicine, 2012; 8: 39. https://doi.org/10.1186/1746-4269-8-39
24. Grace NN, Bussmann RW, Herbal usage and informant consensus in ethnoveterinary management of cattle diseases among the Kikuyus (Central Kenya), Journal of Ethnopharmacology, 2006; 108(3): 332-339. https://doi.org/10.1016/j.jep.2006.05.031
25. Hamrita B, Noumi E, Hafi F, Nazzaro F, Snoussi M, Phytochemical composition and antimicrobial, and anti-quorum sensing activities of Punica granatum L. methanolic extract, Iran J Microbiol, 2022; 14(3): 373-382. doi: 10.18502/ijm.v14i3.9778. PMID: 37124852; PMCID: PMC10132347.
26. Hl Raghavendra, TR Prashith, DM, Phytochemical analysis and in vitro antioxidant activity of Rubus apetalus Poir. (Rosaceae), Pharmacologyonline, 2018; 1.
27. Ibrahim N, Abbas H, El-Sayed NS, et al., Rosmarinus officinalis L. hexane extract: phytochemical analysis, nanoencapsulation, and in silico, in vitro, and in vivo anti-photoaging potential evaluation, Sci Rep, 2022; 12: 13102. https://doi.org/10.1038/s41598-022-16592-7
28. Igwaran A, Iweriebor BC, Ofuzim Okoh S, Nwodo UU, Obi LC, Okoh AI, Chemical constituents, antibacterial and antioxidant properties of the essential oil flower of Tagetes minuta grown in Cala community Eastern Cape, South Africa, BMC Complement Altern Med, 2017; 17(1): 351. doi: 10.1186/s12906-017-1861-6. PMID: 28676058; PMCID: PMC5497343.
29. Jain K, Rizwani F, Thakkar S, A Review on Pharmacological activities of Colocasia esculenta, Research Journal of Pharmacognosy and Phytochemistry, 2023; 10.52711/0975-4385.2023.00019.
30. Jeruto P, Lukhoba C, Ouma G, Otieno D, Mutai C, Herbal treatments in Aldai and Kaptumo divisions in Nandi district, Rift valley province, Kenya, Afr J Tradit Complement Altern Med, 2007; 5: 103-105.
31. Jia X, Grace MH, Esposito D, Wang F, Lila MA, Phytochemical Characterization and Anti-inflammatory Properties of Acacia mearnsii Leaves, 2016.
32. K. Cocquyt, P. Cos, P. Herdewijn, L. Maes, P.E. Van den Steen, G. Laekeman, Ajuga remota Benth.: From ethnopharmacology to phytomedical perspective in the treatment of malaria, Phytomedicine, 2011; 18(14): 1229-1237. https://doi.org/10.1016/j.phymed.2011.08.063
33. Kareru PG, Kenji GM, Gachanja AN, Keriko JM, Mungai G, Africa complementary and alternative medicines. Traditional medicines among the Embu and Mbeere people of Kenya, The African Journal of

Traditional, Complementary and Alternative Medicines, 2007; 4(1): 75-86.
34. Karuppannan K, Priyadharshini S, Sujatha V, Phytopharmacological properties of Albizia species: A review, International Journal of Pharmacy and Pharmaceutical Sciences, 2013; 5: 70-73.
35. Kashani L, Hassanzadeh E, Mirzabeighi A, Akhondzadeh S, Knowledge, attitude and practice of herbal remedies in a group of infertile couples, Acta Medica Iranica, 2013; 51(3): 189–194.
36. Kelly JP, Kaufman DW, Kelley K, Rosenberg L, Anderson TE, Mitchell AA, Recent Trends in Use of Herbal and Other Natural Products, Archives of Internal Medicine, 2005; 165: 281-286.
37. Kemayou G, Kache S, Dzouemo L, Happi G, Kouam S, Tchouankeu J, Phytochemistry, traditional uses, and pharmacology of the genus Ekebergia (Meliaceae): A review, 2021; 5: 110-125. doi: 10.30495/tpr.2021.1928329.1204
38. Kerry S, Bland JM, Statistics notes: The intracluster correlation coefficient in cluster randomization, British Medical Journal, 1998; 316: 1455-1460.
39. Kigen G, Kipkore W, Wanjohi B, Haruki B, Kemboi J, Medicinal Plants Used by Traditional Healers in Sangurur, Elgeyo Marakwet County, Kenya, Pharmacognosy Res, 2017; 9(4): 333-347. doi: 10.4103/pr.pr_42_17. PMID: 29263626; PMCID: PMC5717785.
40. KNBS, Population and Housing census results, 2010; 2009 population census.
41. Kokwaro JO, Medicinal plants of East Africa, Second Edition, University of Nairobi, 1993.
42. Komakech R, Kang Y, Ethnopharmacological Potential of African Cherry [Prunus africana], Journal of Herbal Medicine, 2019. https://doi.org/10.1016/j.hermed.2019.100283
43. Kothari CR, Research Methodology: Methods and Techniques, 2nd ed., New Delhi, Wishwa Parkashan, 2003.
44. Laraib S, Sharif S, Bibi Y, Nisa S, Aziz R, Qayyum A, Phytochemical Analysis and Some Bioactivities of Leaves and Fruits of Myrsine africana Linn, Arabian Journal for Science and Engineering, 2020; 46. doi: 10.1007/s13369-020-04710-4
45. Magadula J, Otieno J, Nondo R, Kirimuhuzya C, Kakudidi E, Orodho J, Okemo P, Anti-Mycobacterial and Toxicity Activities of Some Priority Medicinal Plants from Lake Victoria Basin, Tanzania, European Journal of Medicinal Plants, 2011; 2. doi: 10.9734/EJMP/2012/739
46. Manguro L, Ogur JA, Opiyo SA, Antimicrobial constituents of Conyza floribunda, 2010.
47. Maroyi A, Vangueria madagascariensis Fruit Tree: Nutritional, Phytochemical, Pharmacological, and Primary Health Care Applications as Herbal Medicine, Scientifica (Cairo), 2018; 2018: 4596450. doi: 10.1155/2018/4596450. PMID: 30515346; PMCID: PMC6236520.
48. Maroyi A, Clutia abyssinica Jaub. & Spach (Euphorbiaceae): Medicinal uses, phytochemistry and pharmacological properties, Medicinal Plants - International Journal of Phytomedicines and Related Industries, 2020; 12: 338. doi: 10.5958/0975-6892.2020.00043.X
49. Maroyi A, Evaluation of medicinal uses, phytochemistry and pharmacological properties of Strychnos madagascariensis Poir., Medicinal Plants - International Journal of Phytomedicines and Related Industries, 2021; 13: 369-377. doi: 10.5958/0975-6892.2021.00043.5
50. Marshall NT, Searching for a Cure: Conservation of Medicinal Wildlife Resources in East and Southern Africa, Traffic International, 1998.
51. Michalska K, Kisiel W, Chemical constituents from Lactuca inermis, a wild African species, Biochemical Systematics and Ecology, 2014; 55: 104–106. doi: 10.1016/j.bse.2014.02.027
52. Mukherjee Singh O, Datura stramonium: An overview of its phytochemistry and pharmacognosy, Research J. Pharmacognosy and Phytochemistry, 2013; 5: 143-148.
53. Muthoni GB, Machocho AK, Mwihia SK, Ngugi MP, In Vitro Antioxidant Activities of Methanolic Extracts of Caesalpinia volkensii Harms., Vernonia lasiopus O. Hoffm., and Acacia hockii De Wild, Evid Based Complement Alternat Med, 2020; 2020: 3586268. doi: 10.1155/2020/3586268. PMID: 33062006; PMCID: PMC7537683.
54. Muya S, Waihenya R, Abubakar L, Characterization and anti-oxidant activity of Cucurbita maxima Duchesne pulp and seed extracts, 2018; 7.
55. Nalimu F, Oloro J, Kahwa I, Ogwang PE, Review on the phytochemistry and toxicological profiles of Aloe vera and Aloe ferox, Futur J Pharm Sci, 2021; 7(1): 145. doi: 10.1186/s43094-021-00296-2. Epub 2021 Jul 21. PMID: 34307697; PMCID: PMC8294304.
56. Nana FW, Hilou A, Millogo JF, Nacoulma OG, Phytochemical Composition, Antioxidant and Xanthine Oxidase Inhibitory Activities of Amaranthus cruentus L. and Amaranthus hybridus L. Extracts, Pharmaceuticals (Basel), 2012; 5(6): 613-28. doi: 10.3390/ph5060613. PMID: 24281664; PMCID: PMC3763657
57. Nanyingi MO, Mbaria JM, Lanyasunya AL, Ethnopharmacological survey of Samburu district, Kenya, J Ethnobiology Ethnomedicine, 2008; 4: 14. https://doi.org/10.1186/1746-4269-4-14
58. Naseer S, Hussain S, Naeem N, et al., The phytochemistry and medicinal value of Psidium guajava (guava), Clin Phytosci, 2018; 4: 32. https://doi.org/10.1186/s40816-018-0093-
59. Nawaz H, Shad MA, Muzaffar S, Phytochemical Composition and Antioxidant Potential of Brassica, InTech, 2018. doi: 10.5772/intechopen.76120
60. NCAPD, National Coordinating Agency for Population and Development (NCAPD). Policy Brief No.1: seeking solutions for Traditional Herbal Medicines: Kenya Develops a National Policy, 2007.

61. Ndile MM, Mbinda WM, Ngugi MP, Caesalpinia volkensii: Unexploited Natural Source of Medicine, J Phytopharmacol, 2018; 7(3): 288-291.
62. Nigussie G, Melak H, Endale M, Traditional Medicinal Uses, Phytochemicals, and Pharmacological Activities of Genus Rhamnus: A review, Journal of the Turkish Chemical Society, Section A: Chemistry, 2021; 8: 899-932. doi: 10.18596/jotcsa.929188.
63. Nusrat Subhan, Geoffrey E. Burrows, Philip G. Kerr, Hassan K. Obied, Chapter 9 - Phytochemistry, Ethnomedicine, and Pharmacology of Acacia, 2018. https://doi.org/10.1016/B978-0-444-64057-4.00009-0
64. Nyamwamu L, Ngeiywa M, Mulaa M, Lelo A, Ingonga J, Kimutai A, Phytochemical constituents of Senna didymobotrya Fresen Irwin roots used as a traditional medicinal plant in Kenya, International Journal of Education and Research, 2015; 3.
65. Ogutu AI, Baraza D, Mutai C, Bii C, Phytochemical analysis and antimicrobial activity of Phytolacca dodecandra, Cucumis aculeatus and Erythrina excelsa, Int J Biol Chem Sci, 2012; 6: 692-704. doi: 10.4314/ijbcs.v6i2.13.
66. Okagu IU, Ndefo JC, Aham EC, Udenigwe CC, Zanthoxylum Species: A Comprehensive Review of Traditional Uses, Phytochemistry, Pharmacological and Nutraceutical Applications, Molecules, 2021; 26(13): 4023. doi: 10.3390/molecules26134023. PMID: 34209371; PMCID: PMC8272177.
67. Oza MJ, Kulkarni YA, Traditional uses, phytochemistry and pharmacology of the medicinal species of the genus Cordia (Boraginaceae), J Pharm Pharmacol, 2017; 69: 755-789. https://doi.org/10.1111/jphp.12715
68. Pattewar S, Kalanchoe pinnata: Phytochemical and pharmacological profile, International Journal of Phytopharmacy, 2012; 2. doi: 10.7439/ijpp.v2i1.223.
69. Popova V, Stoyanova A, Mazova N, Phytochemical composition and biological activity of Physalis spp.: A mini-review, Food Science and Applied Biotechnology, 2020; 3: 56. doi: 10.30721/fsab2020.v3.i1.80
70. Prance GT, Whatisethnobotanytoday?, Journal of Ethnopharmacology, 1991; 32: 209–216.
71. Puri A, A review on ethnomedicinal, pharmacological and phytochemical aspects of Sonchus oleraceus Linn. (Asteraceae), International Journal of Pharmacy and Biological Sciences, 2018; 8.
72. Ruiz-Reyes E, Mendoza-Cevallos MA, Polanco-Moreira AP, Segovia-Cedeño DG, Alcivar-Cedeño UE, Dueñas-Rivadeneira A, Phytochemical study of the plant species Bidens pilosa L. (Asteraceae) and Croton floccosus (Euphorbiaceae), F1000Res, 2022; 11: 702. doi: 10.12688/f1000research.112653.2. PMCID: PMC9623199.
73. Sabu S, Kalpana C, Phytochemical constituents and nutrient composition of fresh and cooked Solanum nigrum leaves, Asian Journal of Multidimensional Research (AJMR), 2018; 7: 230-236.
74. Sachin K, Neha S, Amit M, Harsha K, Shreyans KJ, Bharat G, The genus Leucas: A review on phytochemistry and pharmacological activities, Fitoterapia, 2023; 167: 105492. https://doi.org/10.1016/j.fitote.2023.105492
75. Salehi B, Albayrak S, Antolak H, Kręgiel D, Pawlikowska E, Sharifi-Rad M, Uprety Y, Tsouh Fokou PV, Yousef Z, Amiruddin Zakaria Z, Varoni EM, Sharopov F, Martins N, Iriti M, Sharifi-Rad J, Aloe Genus Plants: From Farm to Food Applications and Phytopharmacotherapy, Int J Mol Sci, 2018; 19(9): 2843. doi: 10.3390/ijms19092843. PMID: 30235891; PMCID: PMC6163315.
76. Sambo S, Olatunde A, Kiyawa S, Phytochemical, Proximate and Mineral Analyses of Solanum incanum Fruit, 2016; 3: 8-13.
77. Obakiro SBO, Kiprop A, Kigondu E, K'Owino I, Odero MP, Manyim S, Omara T, Namukobe J, Owor RO, Gavamukulya Y, Bunalema L, Traditional Medicinal Uses, Phytoconstituents, Bioactivities, and Toxicities of Erythrina abyssinica Lam. Ex. DC. (Fabaceae): A Systematic Review, Evidence-based Complementary and Alternative Medicine, 2021. https://doi.org/10.1155/2021/5513484
78. Shyaula S, A review on genus Osyris: Phytochemical constituents and traditional uses, Journal of Natural Pharmaceuticals, 2012; 3: 61. doi: 10.4103/2229-5119.102747
79. Stefanowicz-Hajduk J, Hering A, Kowalczyk M, Hałasa R, Gucwa M, Ochocka JR, Kalanchoe sp. Extracts-Phytochemistry, Cytotoxic, and Antimicrobial Activities, Plants (Basel), 2023; 12(12): 2268. doi: 10.3390/plants12122268. PMID: 37375893; PMCID: PMC10305294.
80. Stepp JR, The role of weeds as sources of pharmaceuticals, Journal of Ethnopharmacology, 2004; 92: 163–166.
81. Stepp JR, Moerman DE, The importance of weeds in ethnopharmacology, Journal of Ethnopharmacology, 2001; 75: 19–23.
82. Sweelam HT, Abd-Alla H, Abdelwahab A, Gabr M, Kirsch G, Secondary Metabolites and Biological Activity of Pentas Species: A minireview, Journal of Advanced Research, 2017; 10. doi: 10.1016/j.jare.2017.12.003.
83. T.R.J. Jeba Malar, J. Antonyswamy, P. Vijayaraghavan, Y.O. Kim, A.A. Al-Ghamdi, M.S. Elshikh, A.A. Hatamleh, M.A. Al-Dosary, S.W. Na, H.-J. Kim, In-vitro phytochemical and pharmacological bio-efficacy studies on Azadirachta indica A. Juss and Melia azedarach Linn for anticancer activity, Saudi Journal of Biological Sciences, 2020; 27(2): 682-688. https://doi.org/10.1016/j.sjbs.2019.11.024
84. Thomas JR, Nelson JK, Silverman SJ, Research methods in physical activity, Human Kinetics, 2011.
85. Tonthubthimthong P, Chuaprasert S, Douglas P, Luewisuttichat W, Supercritical CO2 extraction of

nimbin from neem seeds an experimental study, Journal of Food Engineering, 2001; 47: 289-293.
86. Us M, Mohd K, Muhammad A, Ahmad B, Mohamad M, Mat R, Taxonomical, Phytochemical and Pharmacological Reviews of Musa sapientum var. Paradisiaca, Research Journal of Pharmacy and Technology, 2014; 7: 1356-1361.
87. Vasas A, Orbán-Gyapai O, Hohmann J, The Genus Rumex: Review of traditional uses, phytochemistry and pharmacology, J Ethnopharmacol, 2015; 175: 198-228. doi: 10.1016/j.jep.2015.09.001. PMID: 26384001.
88. Voeks RA, Tropical Forest healers and habitat preference, Economic Botany, 1996; 50: 382–400.
89. Wai Fan K, National Centre for Complementary and Alternative Medicine Website, Journal of the Medical Library Association, 2005; 93(3): 410.
90. Winkler A, Mayer M, Ombay M, Mathias B, Schmutzhard E, Jilek-Aall L, Attitudes towards African traditional medicine and Christian spiritual healing regarding treatment of epilepsy in a rural community of northern Tanzania, African Journal of Traditional, Complementary and Alternative Medicines, 2010; 7(2).