

Supplement material

Table 1: Medicinal plants from African Traditional Medicine used against viral respiratory pathogens, with potential in the management of COVID-19

Medicinal Plant	Family	Parts used	Formulations	Antiviral/other activity reported	Results	References
<i>Acokanthera schimperi</i> (A.DC.) Schweinf.	Apocynaceae	Leaves	Multiple solvent extracts were tested	Antiviral activity	Inhibited 50% parainfluenza at a 1 in 10 dilution	1
<i>Aframomum melegueta</i> K. Schum.	Zingiberaceae	Seed.	Ethanol extract	Extract inhibited measles and yellow fever virus	Inhibited measles and yellow fever viruses at MICs of 125 and 250 µg/mL respectively	2
<i>Alepidia amatymbica</i> Eckl. & Zeyh	Apiaceae	Rhizomes and roots.	Aqueous extract	Isolated compound has moderate anti-HIV activity.	The extract contains rosmarinic acid with promising anti-HIV activity	3
<i>Allium sativum</i> L.	Amaryllidaceae	Bulb	Hexane extract	HIV-1 reverse transcriptase inhibitory effect of hexane extract	Inhibited HIV-1 reverse transcriptase activity. IC ₅₀ = 64.08 µg/mL	1
<i>Artemisia afra</i> Jacq. ex Wild	Asteraceae	Leaf	Tea infusions	Anti-HIV activity	Infusions showed anti-HIV activity	1,4
<i>Artemisia annua</i> L.	Asteraceae	Leaf	Tea infusions	Anti-HIV activity	Infusions showed anti-HIV activity. IC ₅₀ = 2.0 µg/mL	4
<i>Aspalathus linearis</i> (Burm.f.) R. Dahlgren	Fabaceae	Herbal tea made from dried leaves	Fermented and unfermented aqueous, Methanol and Ethanol extracts, infusions	Anti-HIV activity	Consumption of herbal tea can suppress human immunodeficiency virus (HIV) infections	5
<i>Aspalathus linearis</i> (Burm.f.) R. Dahlgren	Fabaceae	Leaves	Leaf infusions	Antiviral activity	The extract inhibited influenza virus A and B production by 50% at 0.2% of the extract	6
<i>Aspilia pluriseta</i> Schweinf	Asteraceae	Leaf	Ethanol extract	Anti-HIV activity	The extract showed a complete cell protection against HIV-induced cytopathic effect	7
<i>Bambusa vulgaris</i> Schrad. ex J.C. Wendl	Poaceae	Leaf	Ethanol extract	Antiviral activity	Inhibition of measles virus at an MIC of 62.5 µg/mL	8
<i>Barleria prionitis</i> L. subsp. <i>delagoensis</i> (Oberm.) Brummitt & J.R.I. Wood	Acanthaceae	Whole plant	Compound isolated from the Dichloromethane extract (6- <i>O</i> -trans- <i>p</i> -coumaroyl-8- <i>O</i> -acetylshanzhiside methyl ester and its <i>cis</i> isomer)	Antiviral activity	The compound inhibited syncytial virus (RSV) production (EC ₅₀ ¼ 2.5 µg/mL).	9
<i>Burkea africana</i> Hook.	Fabaceae	Bark	Purified saponins from Bark extract	Antiviral activity	Bark extracts and eight individual saponins purified from the bark produced potent inhibition of H3N2 influenza Hong Kong strain, with IC ₅₀ values 0.05–0.27 µM.	10

<i>Carissa spinarum</i> L.	Apocynaceae	Leaves	Multiple solvent extracts	Antiviral activity	Inhibited 25% parainfluenza production at a 1 in 10 dilution.	11
<i>Clerodendrum glabrum</i> E. Mey. var. <i>glabrum</i>	Lamiaceae	Leaves	Methanol extract	Antiviral activity	EC ₅₀ value 110 µg/mL against both pre- and post-penetration phases of viral replication. Solvent extracts were substantially more potent than aqueous extracts. No direct interaction with viral hemagglutinin glycoprotein.	12
<i>Costus afer</i> Ker-Gawler	Costaceae	Stalk	Decoction	Antiviral activity	Chicken pox, measles, influenza and genital herpes treatment	13
<i>Crassula globularioides</i> subsp. <i>argyrophylla</i> (Diels ex Schönlund & Baker f.) Toelken	Crassulaceae	Aerial parts	Methanol and Dichloromethane extracts	Antiviral activity	Dichloromethane extract strongly inhibited rhinovirus type 2 production in HeLa cells at concentrations >6 µg/mL	14
<i>Cucumis metuliferus</i> E. Mey ex Naudin	Cucurbitaceae	Fruit	Fruit powder	Antiviral activity	The alkaloids of the plant inhibited the replication of Infectious bursal disease virus (IBDV)	15
<i>Cussonia spicata</i> Thunb.	Araliaceae	Leaves	Methanol extract	Antiviral activity	EC ₅₀ values of 5–15 µg/mL effective against both pre- and post-penetration phases of influenza virus A replication. Solvent extracts more potent than aqueous extracts. No direct interaction with viral hemagglutinin glycoprotein	12
<i>Ekebergia capenses</i> Sparm.	Meliaceae	Bark	Extracted with multiple solvents of varying polarity	Antiviral activity	Inhibited 75% parainfluenza production at a 1 in 10 dilution	16
<i>Enantia chlorantha</i> Oliv	Annonaceae	Stem	Decoction	Antiviral activity	Hepatitis A, B, C and D treatment	17
<i>Helichrysum armenium</i> DC	Asteraceae	Leaves	Aqueous and ethanolic extracts	Antiviral activity	Inhibited parainfluenza virus production. MIC= 4 µg/mL	18
<i>Helichrysum melanacme</i> DC.	Asteraceae	Leaves	Ethanol extract	Antiviral activity	Inhibited influenza virus A production. IC ₅₀ = 10 µg/mL	18
<i>Heteromorpha arborescens</i> (Spreng.) Cham. & Schtdl.	Apiaceae	Root bark	Methanol and Dichloromethane extracts	Antiviral activity	Dichloromethane extract strongly inhibited rhinovirus type 2 production in HeLa cells at concentrations >25 µg/mL	18
<i>Holarrhena pubescens</i> Wall. ex G. Don	Apocynaceae	Bark	Methanol and Dichloromethane extracts	Antiviral activity	Dichloromethane extract strongly inhibited rhinovirus type 2 production in HeLa cells at concentrations >10 µg/mL	18
<i>Jasminum fluminense</i> Vell.	Olacaceae	Stems	Methanol and Dichloromethane extracts	Antiviral activity	Dichloromethane extract strongly inhibited rhinovirus type 2 production in HeLa cells at concentrations >50 µg/mL	18
<i>Momordica charantia</i> L	Cucurbitaceae	Entire plant	Palm wine and water macerate of plant, decoction, plant juice	Antiviral activity	Chicken pox, measles, genital herpes, shingles treatment	19

<i>Pelargonium sidoides</i> DC.	Geraniaceae	Unspecified	A proprietary preparation named EPs 7630 was tested	Antiviral activity	EPs 7360 at 100 µg/mL inhibited the replication of H1N1 and H3N2 influenza virus, parainfluenza virus, HRSV and human coronavirus strain 229E, but did not affect H5N1 influenza strain, adenoviruses and rhinoviruses	18
<i>Pittosporum viridiflorum</i> Sm.	Pittosporaceae	Leaf	Aqueous, methanol, ethanol and acetone extracts	Antiviral activity	EC ₅₀ 3–82 µg/mL against both pre- and post-penetration phases of influenza virus A. replication. Solvent extracts were substantially more potent than aqueous extracts. No direct interaction with viral hemagglutinin glycoprotein.	12
<i>Polygala lancifolia</i> A. St. -Hil. & Moq.	Polygalaceae	Aerial parts	Methanol and Dichloromethane extracts	Antiviral activity	Dichloromethane extract strongly inhibited rhinovirus type 2 production in HeLa cells at concentrations >12 µg/mL.	14
<i>Pteleopsis hylodendron</i> Mildbr.	Combretaceae	Bark	Decoction	Antiviral activity	Chicken pox treatment	20
<i>Pterocarpus angolensis</i> DC.	Fabaceae	Bark	Methanol and Dichloromethane extracts	Antiviral activity	Dichloromethane extract strongly inhibited rhinovirus type 2 production in HeLa cells at concentrations >12 µg/mL	18
<i>Rapanea melanophloeos</i> (L.) Mez.	Primulaceae	Leaves and twigs	Aqueous, methanol, ethanol and acetone extracts	Antiviral activity	EC ₅₀ 113 µg/mL against both pre- and post-penetration phases of influenza virus A. replication. No direct interaction with viral hemagglutinin glycoprotein.	12
<i>Spathodea campanulata</i> P. Beauv.	Bignoniaceae	Bark	Decoction	Antiviral activity	Chicken pox, genital herpes treatment	21
<i>Steganotaenia araliacea</i> Hochest.	Apiaceae	Root	Methanol and Dichloromethane extracts	Antiviral activity	Dichloromethane extract strongly inhibited rhinovirus type 2 production in HeLa cells at concentrations >60 µg/mL	14
<i>Tabernaemontana ventricosa</i> Hochst. ex. A.DC.	Apocynaceae	Leaves	Extracted with multiple solvents of varying polarity	Antiviral activity	EC ₅₀ values of 0.05 µg/mL against both pre- and post-penetration phases of influenza virus A. replication. Solvent extracts were substantially more potent than aqueous extracts. No direct interaction with viral hemagglutinin glycoprotein	18
<i>Vernonia amygdalina</i> Del.	Asteraceae	Leaf, root	Aqueous methanol extract	Anti-HIV activity	Extract contains phenols (caffeoylquinic acids) with antiviral activity	1
<i>Xanthocercis zambesiaca</i> (Baker) Dumaz-le- Grand	Fabiaceae	Leaves	Methanol and Dichloromethane extracts	Antiviral activity	Dichloromethane extract strongly inhibited rhinovirus type 2 production in HeLa cells at concentrations >60 µg/mL	18

Table 2 Medicinal plants used in African Traditional Medicine for some common COVID-19 related symptoms

Symptoms	Plant name	Family	Countries reported from	Parts used/ Formulations/anti-viral activities	Additional common uses
Fever	<i>Centella asiatica</i> (L.) Urb	Apiaceae	Nearly all African countries	Whole plant; a combination of <i>Centella asiatica</i> and <i>Mangifera indica</i> aqueous extracts showed anti-herpes simplex virus activities. ²²	Wounds, ulcers, leprosy, TB, lupus, skin disorders, eye illnesses, fever, asthma, inflammation, rheumatism, hypertension, syphilis, epilepsy, diarrhea, leprosy, and mental illness have all been treated with <i>C. asiatica</i> in the past. It's also used as a spice and eaten as a vegetable. ⁵
	<i>Crinum macowani</i> Baker	Amaryllidaceae	East, Central and Southern Africa	Bulb. Methanolic extract of bulbs showed activity against yellow fever virus and Japanese encephalitis virus. ²³	<i>Crinum macowani</i> 's bulbs, roots, and leaves are used to treat a variety of ailments throughout much of Africa, including back pain, as an emetic, and to increase lactation in both humans and animals, bodily swelling, urinary tract disorders, itchy rashes, acne, boils, diarrhoea, fever, tuberculosis, and sexually transmitted infections. The extracts of the plant show only moderate antifungal action, according to <i>in vitro</i> experiments. ²⁴
	<i>Vernonia amygdalina</i> Del.	Asteraceae	Cameroon, Uganda	Leaf, root. Traditionally used for HIV. Scientifically found to produce antioxidants in AIDS patients. ²⁵	Antiidiabetic, anthelmintic, antiplasmodial, antibacterial, cardiovascular, immunomodulatory, antiplasmodial, antioxidant, and antianaemic activities have been reported in <i>V. amygdalina</i> Del. ^{26,27}
Dry cough/coughs	<i>Acacia senegal</i> (L.) Willd	Leguminosae-Mimosoideae	Southern to Northern Nigeria, North Africa	Gum	Various components of the <i>A. senegal</i> plant have been used to cure infections such as bleeding, bronchitis, diarrhoea, gonorrhoea, leprosy, typhoid fever, and upper respiratory tract infections for millennia. ⁵
	<i>Tulbaghia violacea</i> Harv.	Amaryllidaceae	Southern Africa and Tanzania	Leaf. Used in traditional medicine for respiratory problems and also as an anti-viral, though specific viruses were not mentioned ²⁸	In African traditional medicine, <i>Tulbaghia violacea</i> Harv. (Alliaceae), a herbaceous plant also known as "wild garlic," "society garlic," and "sweet garlic," has been used to manage, regulate, and/or treat a range of human ailments, including hypertension and as an antifungal agent. ²⁹
	<i>Mangifera indica</i> L.	Anacardiaceae	Tanzania, Uganda	Bark, leaf. Dried fruit pulp extract inhibit influenza virus; ³⁰ mangiferin, obtained from fruit peels, exhibited inhibition of polio virus type 1 (PV-1); ³¹ aqueous extract of leaf showed inhibitory activity against Newcastle disease virus (NDV) and infectious bursal disease (IBD) virus. ³²	<i>M. indica</i> leaves are said to have anti-diabetic, antibacterial, antifungal, anthelmintic, antiparasitic, antitumor, anti-HIV, antispasmodic, antipyretic, antidiarrheal, antiallergic, immunomodulation, antimicrobial, and hepatoprotective properties, and have been used for centuries to treat malaria, throat infections, burns, and scalds. In the past, mango stem bark was used to cure menorrhagia, scabies, diarrhoea, syphilis, diabetes, skin problems, and anemia. ³³

<i>Cascabela thevetia</i> (L.) Lippold	Apocynaceae	Uganda	Root	An emetic made from a bark or leaf decoction is used to relax the bowels and is reported to be an excellent therapy for intermittent fevers. In Senegal, water with macerated leaves and bark is used to treat amenorrhea, while in Ghana, decoctions of the leaves are used to treat jaundice, fever, and as a purgative for intestinal worms. Latex is used in Mali to soften corns and calluses. The leaf sap is used as eye and nose drops in Benin and Côte d'Ivoire to treat strong headaches; it is also poured into the nostrils to revive patients who have fainted and to treat colds. To treat colds, the Luo people of Kenya drink water that has been crushed with leaves. Purgative properties are possible with the seeds. Because hazardous doses are just slightly greater than therapeutic doses, caution should be exercised in all medical applications, particularly those used internally.
<i>Acacia tortilis</i> (Forssk.) Schweinf.	Fabaceae	Djibouti	Plant is applied on burning charcoal and smoke inhaled nasally for dry coughs; same thing is done with roots for coughs with phlegm.	Diabetes mellitus is treated using polysaccharide extracted from gum exudates. For fungal illness, use stem bark. Diarrhoea is treated with Bark Tannins, Infectious Disease Stem Bark, Cough and Diphtheria with wood. Malaria treatment with root bark, hypercholesterolemia treatment with aqueous extract, and inflammation treatment with aqueous extract and methanol extract of <i>Acacia tortilis</i> for Leishmania and parasitic illness. ^{27,34}
<i>Guiera senegalensis</i> J.F. Gmel.	Combretaceae	Tropical Africa in dry areas from Senegal to Sudan	Decoction of leaves, roots and gall of the plant are used in the treatment of cough and tuberculosis ³⁵⁻³⁷ <i>Guiera senegalensis</i> J.F. Gmel is a broad-spectrum African folk-medicinal plant, having activities against fowlpox and herpes viruses and <i>G. senegalensis</i> leaves extract (GSLE) have potential for anti-hepatitis B virus (HBV). ³⁸	The extract from the leaves is used to treat jaundice, which accounts for more than 51.5 percent of the disorders treated; diabetes mellitus, hypertension, cough, arthritis, enteritis, diarrhoea, and malaria account for 48.5 percent of the other ailments treated. <i>Guiera senegalensis</i> root powder is used to heal wounds such as diabetic sores, skin inflammation, and injuries. ³⁹ Antitussive, bronchodilating, anti-infectious, analgesic, antipyretic, and anti-inflammatory qualities of the <i>Guiera senegalensis</i> could explain its use in the treatment of cough, bronchitis, tuberculosis, and colds. ⁴⁰
<i>Sterculia setigera</i> Del.	Sterculiaceae	East Africa, Ethiopia, Senegal, Sudan-Sahel, Sudan-Guinea, Nigeria and Togo	Décoction of stem barks of the plant ⁴¹ [Leaves, roots, bark of <i>S. setigera</i> have been found to possess anti-viral activity against three human and three animal viruses (Poliovirus (type 1), astrovirus, human herpes simplex virus (type 1), equine herpes simplex virus, bovine parvovirus and canine parvovirus have also been reported. ⁴²	Cough, stomachaches, gonorrhoea, acne, diarrhoea, rickets, wounds, and epilepsy are some of the conditions that <i>S. setigera</i> can help with. Stomachaches, heart palpitations, coughs, and rachitis are all treated with the bark. The stem bark decoction is used to treat asthma, bronchitis, wounds, fevers, toothaches, gingival sores, abscesses, and diarrhoea. To cure constipation, gum is utilized in the preparation of sauce. The gum is used to make couscous and sauces by Senegalese housewives. The herb is used to alleviate constipation in southwest Nigeria. Gum powder was used by Sudanese in the south-eastern part of the country to treat toothaches. ⁴³

	<i>Bridelia ferruginea</i> Benth.	Euphorbiaceae	Benin, Nigeria, Burkina Faso and Ivory Coast	Infusion of roots of the plant. ⁴⁴	<i>Bridelia ferruginea</i> is often used to cure a range of conditions in both general African and West African traditional medicine, including bladder difficulties, diabetes, diarrhoea, arterial hypertension, and rheumatic pain. ⁴⁵
	<i>Terminalia avicennioides</i> Guill. & Perr.	Combretaceae	Nigeria, South Africa and Tanzania	Maceration of leaves of the plant. ⁴¹	Bronchitis and TB are treated with trunk bark and guis of <i>Terminalia avicennioides</i> . Extracts of <i>Terminalia avicennioides</i> have been shown to have antimicrobial effects in vitro against bacteria isolated from individuals with respiratory disease problems, as well as anti-Mycobacterium tuberculosis activity in extracts of triterpenoids obtained from root bark. Antimicrobial activity has also been discovered in flavonoids and saponosides extracted from root bark.
	<i>Euphorbia hirta</i> L.	Euphorbiaceae		Whole plant parts are used ⁴⁶ The aqueous and 50% MeOH extracts of <i>Euphorbia hirta</i> demonstrated a specific inhibition of three types of immunodeficiency viruses: SIVmac251, HIV-1 and HIV-2 replication in MT4 cells in vitro ⁴⁷	Intestinal parasites, diarrhoea, peptic ulcers, heartburn, vomiting, and amoebic dysentery are all treated with <i>Euphorbia hirta</i> decoction or infusion, as well as respiratory disorders like asthma, bronchitis, hay fever, laryngeal spasms, emphysema, coughs, and colds. The leaves are used to treat urogenital diseases (kidney stones, menstrual problems, sterility, and venereal diseases); skin and mucous membrane affections (including warts, scabies, tinea, thrush, aphthae, and fungal afflictions); and measles, Guinea-worm, and as an antiseptic to treat wounds, sores, and conjunctivitis. The herb is used as an analgesic, antipyretic, and anti-inflammatory to treat severe headaches, toothaches, rheumatism, colic, and pains during pregnancy. It's used to cure jaundice, hypertension, oedema, anemia, and malaria, as well as hart an aphrodisiac and to make childbirth easier. The plants are commonly used as a galactagogue in West Africa, and they are even sold as such in Nigeria. To induce labor during childbirth in Uganda, whole herbs are consumed. ⁴⁸
Tiredness	<i>Crassocephalum vitellinum</i> S. Moore	Asteraceae	Uganda, Burundi, Cameroon, Kenya, Rwanda, Tanzania, Zambia, Democratic Republic of Congo	Leaf. Mode of use not given for energy boosting effect.	Fever, diarrhoea, oral candidiasis, syphilis, energy boosting, tumors, uterine pains, and headaches are all symptoms of herpes zoster. Essential oil and fractions were also found to have potent antifungal activity against <i>C. neoformans</i> and <i>C. albicans</i> . On the yeasts, the fractions were more active than the pure oil. The study found that after further fractionation of <i>C. vitellinum</i> essential oils, the hexane soluble fractions had the maximum sensitivity to <i>C. neoformans</i> . The water and ethanol extracts, on the other hand, were ineffective against the bacterial strains tested. The 38 ethanolic extract has poor antibacterial action in <i>C. vitellinum</i> , according to similar observations. ⁴⁸

Aches and pains	<i>Aloe ferox</i> Mill.	Xanthorrhoeaceae	South Africa, Lesotho	Gel applied topically. Aqueous extract of plant active against herpes simplex virus type 1. ⁴⁹	It's best recognized for its laxative qualities and as a skin, eye, and mucous membranes topical treatment. Scientific investigations have backed up many of the traditional applications. The cosmetic industry's interest in <i>A. ferox</i> gel has recently increased. <i>A. ferox</i> gel, according to sources, has at least 130 medicinal compounds with anti-inflammatory, analgesic, calming, antiseptic, germicidal, antiviral, antiparasitic, antitumor, and anticancer activities, spanning all traditional uses and scientific studies on <i>A. ferox</i> and its constituents. ⁵
	<i>Artemisia herba-alba</i> Asso ⁵	Asteraceae	Tunisia	Herbal tea (tea made from boiling leaves in water).	It is used to treat arterial hypertension and diabetes in Moroccan herbal medicine, and diabetes, bronchitis, diarrhea, hypertension, and neuralgias in Tunisian traditional medicine. Herbal tea has been used in traditional medicine as an analgesic, antimicrobial, antispasmodic, and hemostatic agent. During an ethno-pharmacological survey among the Bedouins of the Negev desert, <i>A. herba-alba</i> was discovered to be used to treat stomach problems. ⁵
Sore throat	<i>Acacia senegal</i> (L.) Willd ⁵ .	Leguminosae-Mimosoideae	Northern Nigeria, North Africa	Gum	For millennia, the gum of <i>A. senegal</i> has been used to treat infections such as hemorrhage, bronchitis, diarrhoea, gonorrhoea, leprosy, typhoid fever, and infections of the upper respiratory tract. ⁵
Diarrhoea	<i>Acacia senegal</i> (L.) Willd ⁵⁵⁵⁵	Leguminosae-Mimosoideae	Northern Nigeria, West and	Gum	
	<i>Artemisia herba-alba</i> Asso	Asteraceae	Tunisia	Herbal tea (tea made from boiling leaves in water)	Cough, stomach and intestinal disturbance, the common cold, measles, diabetes, yellowed skin (jaundice), nervousness, irregular pulse, and muscle weakness are all treated with <i>Artemisia herba-alba</i> . Roundworms, pinworms, tapeworms, hookworms, and flukes are among the parasitic infections treated with it. ⁵
	<i>Mangifera indica</i> L.	Anacardiaceae	Tanzania, Uganda	Bark, leaf	The leaves of <i>Mangifera indica</i> are used to cure diabetes in Nigerian traditional medicine. According to studies, it contains anti-diabetic, antioxidant, antiviral, cardiogenic, hypotensive, and anti-inflammatory properties. Antibacterial, antifungal, anthelmintic, antiparasitic, antitumor, anti-HIV, antibone resorption, antispasmodic, antipyretic, antidiarrheal, antiallergic, immunomodulation, hypolipidemic, antimicrobial, hepatoprotective, and gastroprotective characteristics have all been looked at. ⁵⁰
	<i>Alepidia amatymbica</i> Eckl. & Zeyh.	Apiaceae	South Africa	Bark, root.	Also used for the treatment of digestive system disorders, which include indigestion, constipation, stomach aches, diarrhoea, and vomiting. Other uses include treatment of cold, coughs, influenza, and chest pain. Fresh roots and rhizomes may be chewed three times a day for common cold and cough. Dried roots are also boiled and ½ cup of the decoction is taken twice daily for constipation. ⁵¹
	<i>Tithonia diversifolia</i> (Hemsl.) A. Gray	Asteraceae	Rwanda	Leaf	

	<i>Vernonia amygdalina</i> Del.	Asteraceae	Tanzania, Uganda	Leaf, root	Flavonoids from VA have been shown to have strong antioxidant properties, while its saponins have been shown to have antitumoral properties in leukemia cells. VA peptides are known to be powerful inhibitors of mitogen-activated protein kinases (MAPKs), which are important for breast tumor growth and also serve as a critical regulatory point for the tumor. ^{52,53}
Conjunctivitis/Eye infections	<i>Aloe ferox</i> Mill.	Xanthorrhoeaceae	South Africa, Lesotho	Fresh bitter sap applied directly. ⁵	
	<i>Acacia etbaica</i> Schweinf.	Fabaceae	Djibouti	Leaves are grounded in water and the eye washed with the water. ^{27,54}	The extracts exhibited high cytotoxic, antibacterial, wound healing and antifungal activity. ⁵⁵
	<i>Aloe mcloughlinii</i> Christian	Aloaceae	Djibouti	Fresh leaves are soaked in water and the water used as eye drop. Exudate also used for eye infections in Ethiopia. ²⁷	
Headache	<i>Vernonia amygdalina</i> Del.	Asteraceae	Uganda	Leaf. Formulation not given. ⁵⁶	
Loss of taste or smell (ageusia, anosmia)j	No such plants as direct remedy for loss of taste or smell are known for African medicinal plants. African medicines treatments are holistic and treatment of colds which includes loss of smell associated with the condition. Again, the loss of taste can also be as a result of cold and flu. Ayurveda recommends garlic, lemon juice, mint or ginger to get relief from cold and so restore the sensory loss of taste or smell during cold. From that viewpoint, African plants against cold can be tried.				
A rash on skin, or discolouration of fingers or toes	<i>Vernonia amygdalina</i> Del.	Asteraceae	Tanzania, Uganda	Leaf, root ^{56,57}	Also used traditionally by AIDS patients for chronic diarrhoea, herpes zoster and herpes simplex in Bukoba rural district, Tanzania; also used by AIDS patients for treatment of fever, general rash, pain (headache, back), cough, and stomach ache in Kabarole district, Western Uganda. ⁵⁷
	<i>Elaeodendron transvaalense</i> (Burt Davy) R.H. Archer	Celastraceae	South Africa	Roots. Root extract	Also inhibits HIV Type 1 reverse transcriptase and integrase. ⁵⁸
Difficulty breathing or shortness of breath	<i>Acacia senegal</i> (L.) Willd.	Leguminosae-Mimosoideae	Northern Nigeria	Gum	
	<i>Aspalathus linearis</i> (Burm.f.) R. Dahlgren	Fabaceae	South Africa	Herbal tea made from dried leaves. <i>In vitro</i> data has shown that the daily intake of the alkaline extracts of the red rooibos tea could suppress HIV infections in the extract. ⁵	It has anti-inflammatory, immunomodulating, and chemopreventive properties. The plant is mineral-rich and tannin-free. There is mounting evidence that the flavonoids included in the plant have a significant role in the prevention of cardiovascular disease and other age-related diseases. Aspalathin has been demonstrated in recent research to have favorable effects on glucose levels, homeostasis in Type 2 diabetes by boosting glucose absorption in muscle tissues and insulin release from pancreatic beta-cells, according to evidence-based complementary and alternative medicine. <i>In vitro</i> and <i>in vivo</i> studies have shown that rooibos tea has bronchodilator, antispasmodic, and blood pressure-lowering properties. The antispasmodic effect through potassium ionchannel activation has been reported. ⁵

Chest pain or pressure	<i>Acacia mellifera</i> (Vahl) Benth ^{59,59,58,59}	Fabaceae	Djibouti	Fresh leaves are chewed ²⁷	In traditional Kenyan medicine, <i>Acacia mellifera</i> is a valuable medicinal shrub. Syphilis and pneumonia are treated using the plant's stem bark. The triterpenoids found in this plant have been isolated and found to be cytotoxic and antimalarial. ⁶⁰
Loss of speech (dysphasia/dysarthria) or movement (paresis)	<i>Diospyros sanza-minika</i> A. Chevalier	Ebenaceae	Sierra Leone, Ghana, Cameroon, Gabon and Congo	Leaf (for paresis). The possesses an anti-HBV activity and exerts its antiviral effects via inhibition of HBV transcription. ⁶¹	The antimalarial activity of the pure constituents of <i>Diospyros sanza-minika</i> and of the methanol extract from the stem bark of is reported for the first time. The results provide interesting baseline information for the potential use of the crude extract well as some of the isolated compounds in the search for novel antimalarial compounds. ⁶¹

Note: The claims in Tables 1 and 2 are based on data from preclinical studies and ethnobotanical surveys which have not been subjected to verification through randomized control clinical trials.

References

1. Tegen D, Dessie K, Damtie D. Candidate Anti-COVID-19 Medicinal Plants from Ethiopia: A Review of Plants Traditionally Used to Treat Viral Diseases. *Evidence-Based Complementary and Alternative Medicine* 2021; **2021**.
2. Omotuyi IO, Nash O, Ajiboye BO, et al. Aframomum melegueta secondary metabolites exhibit polypharmacology against SARS-CoV-2 drug targets: in vitro validation of furin inhibition. *Phytotherapy Research* 2021; **35**(2): 908-19.
3. Wintola O, Afolayan A. Alepidea amatymbica Eckl. & Zeyh.: A review of its traditional uses, phytochemistry, pharmacology, and toxicology. *Evidence-Based Complementary and Alternative Medicine* 2014; **2014**.
4. Lubbe A, Seibert I, Klimkait T, van der Kooy F. Ethnopharmacology in overdrive: the remarkable anti-HIV activity of Artemisia annua. *J Ethnopharmacol* 2012; **141**(3): 854-9.
5. Mahomoodally MF. Traditional medicines in Africa: an appraisal of ten potent African medicinal plants. *Evidence-Based Complementary and Alternative Medicine* 2013; **2013**.
6. Rahmasari R, Haruyama T, Charyasriwong S, Nishida T, Kobayashi N. Antiviral activity of Aspalathus linearis against human influenza virus. *Natural product communications* 2017; **12**(4): 1934578X1701200432.
7. Attah AF, Fagbemi AA, Olubiyi O, et al. Therapeutic Potentials of Antiviral Plants Used in Traditional African Medicine With COVID-19 in Focus: A Nigerian Perspective. *Frontiers in pharmacology* 2021; **12**.
8. Ojo O, Oluyeye J, Famurewa O. Antiviral properties of two Nigerian plants. *African Journal of Plant Science* 2009; **3**(7): 157-9.
9. Chen JL, Blanc P, Stoddart CA, et al. New iridoids from the medicinal plant Barleria prionitis with potent activity against respiratory syncytial virus. *Journal of natural products* 1998; **61**(10): 1295-7.
10. Mair CE, Grienke U, Wilhelm A, et al. Anti-influenza triterpene saponins from the bark of Burkea africana. *Journal of natural products* 2018; **81**(3): 515-23.
11. Wangteeraprasert R, Lipipun V, Gunaratnam M, Neidle S, Gibbons S, Likhitwitayawuid K. Bioactive compounds from Carissa spinarum. *Phytotherapy Research* 2012; **26**(10): 1496-9.
12. Mehrbod P, Abdalla MA, Njoya EM, et al. South African medicinal plant extracts active against influenza A virus. *BMC complementary and alternative medicine* 2018; **18**(1): 1-10.
13. RA NN, ML KM, PR MC, et al. Ethnobotanical survey of some Cameroonian plants used for treatment of viral diseases. *African Journal of Plant Science* 2011; **5**(1): 15-21.
14. Beuscher N, Bodinet C, Neumann-Haefelin D, Marston A, Hostettmann K. Antiviral activity of African medicinal plants. *J Ethnopharmacol* 1994; **42**(2): 101-9.
15. Gupta S, Kanwar SS. Plant protease inhibitors and their antiviral activities-Potent therapeutics for SARS CoV-2. *Journal of Medical Discovery* 2021; **6**(1): 1-14.
16. Bagla VP, McGaw LJ, Eloff JN. The antiviral activity of six South African plants traditionally used against infections in ethnoveterinary medicine. *Veterinary microbiology* 2012; **155**(2-4): 198-206.
17. Mpiana PT, Tshibangu DS, Kilembe JT, et al. Aloe vera (L.) Burm. F. as a potential anti-COVID-19 plant: a mini-review of its antiviral activity. *European Journal of Medicinal Plants* 2020: 86-93.
18. Cock IE, Van Vuuren SF. The traditional use of southern African medicinal plants for the treatment of bacterial respiratory diseases: A review of the ethnobotany and scientific evaluations. *J Ethnopharmacol* 2020: 113204.
19. Dossou-Yovo HO, Kindomihou V, Sinsin B. Application of Ethnobotanical Indices to Assess the Diversity of Medico-magic Knowledge on Four Herbaceous Species in Benin. 2020.
20. Nana HM, Ngane RN, Kuate J, et al. Acute and sub-acute toxicity of the methanolic extract of Pteleopsis hylodendron stem bark. *J Ethnopharmacol* 2011; **137**(1): 70-6.
21. FEDOUNG EF, BIWOLE A, BIYEGUE CFN, et al. Searching nature-based solutions to emerging diseases: a preliminary review of Cameroonian medicinal plants with potentials for the management of COVID-19 pandemic. 2020.
22. Yoosook C, Bunyapraphatsara N, Boonyakiat Y, Kantasuk C. Anti-herpes simplex virus activities of crude water extracts of Thai medicinal plants. *Phytomedicine* 2000; **6**(6): 411-9.

23. Duri ZJ, Scovill JP, Huggins JW. Activity of a methanolic extract of Zimbabwean *Crinum macowanii* against exotic RNA viruses in vitro. *Phytotherapy Research* 1994; **8**(2): 121-2.
24. Maroyi A. A review of ethnobotany, therapeutic value, phytochemistry and pharmacology of *Crinum macowanii* Baker: A highly traded bulbous plant in Southern Africa. *J Ethnopharmacol* 2016; **194**: 595-608.
25. Laila U, Akram M, Shariati MA, et al. Role of medicinal plants in HIV/AIDS therapy. *Clinical and Experimental Pharmacology and Physiology* 2019; **46**(12): 1063-73.
26. Danladi S, Hassan MA, Masa'ud IA, Ibrahim UI. *Vernonia amygdalina* Del: A mini review. *Research Journal of Pharmacy and Technology* 2018; **11**(9): 4187-90.
27. Hassan-Abdallah A, Merito A, Hassan S, et al. Medicinal plants and their uses by the people in the Region of Randa, Djibouti. *J Ethnopharmacol* 2013; **148**(2): 701-13.
28. Krstin S, Sobeh M, Braun MS, Wink M. *Tulbaghia violacea* and *Allium ursinum* extracts exhibit anti-parasitic and antimicrobial activities. *Molecules* 2018; **23**(2): 313.
29. Moodley K, Mackraj I, Naidoo Y. Cardiovascular effects of *Tulbaghia violacea* Harv.(Alliaceae) root methanolic extract in Dahl salt-sensitive (DSS) rats. *J Ethnopharmacol* 2013; **146**(1): 225-31.
30. Amin A. AL Dulaimi and Marwa AA AL Rawi, Antiviral Activity of *Mangifera* Extract on Influenza Virus Cultivated in Different Cell Cultures. *J Pure Appl Microbiol* 2019; **13**(1): 455-8.
31. Rechenchoski D, Galhardi L, Cunha A, Ricardo N, Nozawa C, Linhares R. Antiviral potential of mangiferin against poliovirus. *Int J Pharmacol Res* 2018; **8**: 34-9.
32. Gupta A, Chaphalkar SR. Virucidal potential of *Prosopis spicigera* and *Mangifera indica* on human peripheral blood mononuclear cells. *Journal of HerbMed Pharmacology* 2016; **5**(4): 162-5.
33. Kuete V. Medicinal spices and vegetables from Africa: therapeutic potential against metabolic, inflammatory, infectious and systemic diseases: Academic Press; 2017.
34. Verma S. A review study on *Acacia Tortillis*. *Life* 2016; **50**: 22.
35. Nadembega P, Boussim JI, Nikiema JB, Poli F, Antognoni F. Medicinal plants in baskoure, kourittenga province, Burkina Faso: an ethnobotanical study. *J Ethnopharmacol* 2011; **133**(2): 378-95.
36. Diop EA, Queiroz EF, Kicka S, et al. Survey on medicinal plants traditionally used in Senegal for the treatment of tuberculosis (TB) and assessment of their antimycobacterial activity. *J Ethnopharmacol* 2018; **216**: 71-8.
37. Sanogo R, De Pasquale R, Germano M. The antitussive activity of *Guiera senegalensis* JF Gmel (Combretaceae). *Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives* 1998; **12**(2): 132-4.
38. Parvez MK, Alam P, Arbab AH, Al-Dosari MS, Alhowiriny TA, Alqasoumi SI. Analysis of antioxidative and antiviral biomarkers β -amyrin, β -sitosterol, lupeol, ursolic acid in *Guiera senegalensis* leaves extract by validated HPTLC methods. *Saudi pharmaceutical journal* 2018; **26**(5): 685-93.
39. Alshafei NK, Ahmed S, Abdelfattah N. Preliminary Observations on the Uses of *Guiera Senegalensis* as a Traditional Medicinal Plants in Western Kurdofan, Sudan. *Journal of Plant Biochemistry and Physiology* 2016.
40. Haidara M, Diarra ML, Doumbia S, et al. Plantes médicinales de l'Afrique de l'Ouest pour la prise en charge des affections respiratoires pouvant se manifester au cours de la Covid-19. *International Journal of Biological and Chemical Sciences* 2020; **14**(8): 2941-50.
41. Zerbo P, Millogo-Rasolodimey J, Nacoulma-Ouerdraogo O, Van Damme P. Contribution à la connaissance des plantes médicinales utilisées dans les soins infantiles en pays San, au Burkina Faso. *International Journal of Biological and Chemical Sciences* 2007; **1**(3): 262-74.
42. Babalola IT, Adelakun EA, Wang Y, Shode FO. Anti-TB activity of *Sterculia setigera* Del., leaves (Sterculiaceae). *Journal of Pharmacognosy and Phytochemistry* 2012; **1**(3): 17-21.
43. Atakpama W, Batawila K, Dourma M, et al. Ethnobotanical knowledge of *Sterculia setigera* Del. in the Sudanian zone of Togo (West Africa). *International Scholarly Research Notices* 2012; **2012**.
44. Koné M, Atindehou K, Téré H, Traoré D. Quelques plantes médicinales utilisées en pédiatrie traditionnelle dans la région de Ferkessédougou (Côte d'Ivoire). *Bioterre* 2002; **30**: 30-6.
45. Alowanou G, Olounlade A, Azando E, Dedehou V, Daga F, Hounzangbe-adote M. A review of *Bridelia ferruginea*, *Combretum glutinosum* and *Mitragina inermis* plants used in zootherapeutic remedies in West Africa: historical origins, current uses and implications for conservation. *Journal of Applied Biosciences* 2015; **87**: 8003-14.

46. Mann A, Amupitan J, Oyewale A, Okogun J, Ibrahim K. An Ethnobotanical survey of indigenous flora for treating tuberculosis and other respiratory diseases in Niger State, Nigeria. *Journal of Phytomedicine and Therapeutics* 2007; **12**: 1-21.
47. Gyuris A, Szlavik L, Minarovits J, Vasas A, Molnar J, Hohmann J. Antiviral activities of extracts of *Euphorbia hirta* L. against HIV-1, HIV-2 and SIVmac251. *in vivo* 2009; **23**(3): 429-32.
48. Asimwe S. Nutri-medicinal plants used in the management of HIV/AIDS opportunistic infections in Western Uganda: documentation, phytochemistry and bioactivity evaluation: KTH Royal Institute of Technology; 2015.
49. Kambizi L, Goosen B, Taylor M, Afolayan A. Anti-viral effects of aqueous extracts of *Aloe ferox* and *Withania somnifera* on herpes simplex virus type 1 in cell culture: research in action. *South African Journal of Science* 2007; **103**(9): 359-60.
50. Shah K, Patel M, Patel R, Parmar P. *Mangifera indica* (mango). *Pharmacognosy reviews* 2010; **4**(7): 42.
51. Buwa-Komoren LV, Mayekiso B, Mhinana Z, Adeniran AL. An ethnobotanical and ethnomedicinal survey of traditionally used medicinal plants in Seymour, South Africa: An attempt toward digitization and preservation of ethnic knowledge. *Pharmacognosy Magazine* 2019; **15**(60): 115.
52. Adaramoye OA, Akintayo O, Achem J, Fafunso MA. Lipid-lowering effects of methanolic extract of *Vernonia amygdalina* leaves in rats fed on high cholesterol diet. *Vascular health and risk management* 2008; **4**(1): 235.
53. Burkill HM. The useful plants of west tropical Africa, Vols. 1-3. *The useful plants of west tropical Africa, Vols 1-3* 1995; (2. ed.).
54. Belayneh A, Demissew S, Bussa NF, Bisrat D. Ethno-medicinal and bio-cultural importance of aloes from south and east of the Great Rift Valley floristic regions of Ethiopia. *Heliyon* 2020; **6**(6): e04344.
55. Kayed AM, Genady EA, Kadry HA, Elghaly E-SM. New phytoconstituents, anti-microbial and cytotoxic activities of *Acacia etbaica* Schweinf. *Natural Product Research* 2020: 1-10.
56. Langlois-Klassen D, Kipp W, Jhangri GS, Rubaale T. Use of traditional herbal medicine by AIDS patients in Kabarole District, western Uganda. *The American journal of tropical medicine and hygiene* 2007; **77**(4): 757-63.
57. Kisangau DP, Lyaruu HV, Hosea KM, Joseph CC. Use of traditional medicines in the management of HIV/AIDS opportunistic infections in Tanzania: a case in the Bukoba rural district. *Journal of Ethnobiology and Ethnomedicine* 2007; **3**(1): 1-8.
58. Bessong PO, Obi CL, Andréola M-L, et al. Evaluation of selected South African medicinal plants for inhibitory properties against human immunodeficiency virus type 1 reverse transcriptase and integrase. *J Ethnopharmacol* 2005; **99**(1): 83-91.
59. Hassan-Abdallah A, Merito A, Hassan S, et al. Medicinal plants and their uses by the people in the Region of Randa, Djibouti. *J Ethnopharmacol* 2013; **148**(2): 701-13.
60. Mutai C, Bii C, Vagias C, Abatis D, Roussis V. Antimicrobial activity of *Acacia mellifera* extracts and lupane triterpenes. *J Ethnopharmacol* 2009; **123**(1): 143-8.
61. Tangmouo JG, Ho R, Matheussen A, et al. Antimalarial activity of extract and norbergenin derivatives from the stem bark of *Diospyros sanza-minika* A. Chevalier (Ebenaceae). *Phytotherapy Research* 2010; **24**(11): 1676-9.
