

A Review of Potential Medicinal Plants in Prevention and Cure of Covid-19

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Abstract

Coronavirus Disease -2019 (COVID-19) is a novel respiratory infection caused by severe acute respiratory syndrome coronavirus-2 (SAR-COV-2) of the family coronavirus. Despite the high mortality and morbidity rates associated with COVID-19 pandemic, there is no known drug effective for treatment. Recently some vaccines have been rolled out and vaccination ongoing, however, there are controversies and uncertainty of the consequences associated with the use of the vaccines. Several studies on conventional antivirals or immunomodulators have not yielded significant success against COVID-19. It is believed that consumption of some herbal preparations can prevent or cure COVID-19. Review of studies and trials with some medicinal plants with certain natural phytochemicals indicated possibility of their use for prevention and treatment of COVID_19. Some plants with varied potential antiviral activities include; turmeric (*Curcuma longa*), Garlic (*Allium sativum*) citrus species (lemon and lime), Guava (*Psidium guajava*) Mango (*Mangifera indica*), lemon grass (*Cymbopogon citratus*) Pawpaw (*Carica papaya*), Bitter kola (*Garcinia kola*), Bitter guard (*Sida cordifolia*) sent leaf (*Ocimum gratissimum*) *Artemisia annua*, Aloe vera, and *Echinacea* species. The case for exploration and use of medicinal plants is anchored by the emergence of a number of drugs from plant sources with proven efficacy for treatment and management of respiratory diseases. It is recommended that medicinal plants with proven efficacy be used while further investigation be carried out to ascertain the effectiveness of other locally available plants for prevention and management of COVID-19.

Keywords: Covid-19, medicinal plants, phytochemicals, vaccines, pandemic.

Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-COV-2) has infected over 524,339,768 million people across over 210 countries worldwide and over 6,281,260 million death have been recorded by May, 2022. World Health Organization (WHO), (2022) Coronavirus -2 (COVID-19) was first detected on the 8th December 2019 in Wuhan, city, Hubei Province, China and spread rapidly to different part of the world (WHO, 2020). COVID-19 has become the most significant public health problems today. Total confirmed cases of COVID-19 in Nigeria as at May 25th 2022, 25,6004 with 3,143 deaths recorded (NCDC, 2022)

There are no effective and safe drugs that can be used to treat COVID-19. Recently some vaccines have been rolled out, but there are controversies and concerns on the use of the vaccines with respect to the uncertainty of their side effects (Kerr *et al.*, 2021). The vaccines include; Astra-zaneca-oxford, Moderna, Pfizer-Biotech, Putnik, and Johnson and Johnsons.

There are some potential therapeutic agents for COVID-19 management such as antiviral agents, chloroquine/hydroxychloroquine, dexamethasone, and convalescent plasma transfusion, but most

of them still show inconsistent results (Nugraha *et al.*, 2020). The existence of variants of COVID-19 which are very virulent, has further compounded the problem.

According to Khadka *et al.*, (2021), there is a strong inter-relationship between people and plants according to needs. All over the world, people are dependent on plants for different purposes such as for food, medicine, and houses, (Martin, 2014). Plant species have always been a fundamental source for the discovery of drugs (Aborode *et al.*, 2020). People had used medicinal plants to fight against pandemics in the past (Zhang, 2020), and dependency of people on medicinal plants might have increased in these days around the world as medicinal plants can be an alternative option to prevent COVID-19 (Luo *et al.*, 2019). Different researchers have suggested herbal medicine as a potential option to cure or prevent COVID-19 (Velligin *et al.*, 2020).

Countries like China and India are integrating the use of medicinal plant with western medicine to boost the immunity power of COVID-19 patients (Mandal, 2020). In China, traditional medicine showed encouraging results in improving symptom management and reducing the deterioration, mortality, and recurrence rates (Mandal, 2020). (WHO, (2020) claims medicinal plants might be good for the health and in supporting the immune system, but not in preventing or curing COVID-19, while in China, traditional medicine showed encouraging results in improving systems management and recovery (Khadka, 2021)

Herbal medicines are known to have fewer or no adverse effects for therapeutic and preventive application in illnesses (Hastantram, 2020). Traditional Chinese herbal medicine (TCM) has been used as a first line treatment for COVID-19 since the emergence of SARS-COV-2 (Mandal, 2020).

In Nigeria, the use of herbs for the treatment and management of infections and diseases is part of their tradition and custom. According to Gbadamosi,(2020). The dependency on botanicals has been attributed to the availability of a diversity of medicinal plants.

In traditional medicine, the prevention of infectious diseases relies on the use of botanical detoxifiers, immune boosting remedies, natural antioxidants, plant haematinics and spices.

Based on the fact that COVID-19 is a viral infection, the use of antiviral medicinal plants might be useful in its prevention and management. (Attah *et al.*, 2021). Considering the symptoms of COVID-19 infection - fever, cough, body pain, flu, cold and shortness of breath, plants with antimalarial effect, cough remedy, herbal analgesic and medicinal plants a plausible therapeutic effect in respiratory tract infections could be useful in the prevention of COVID-19 infection. Gbadamosi, (2020), Aborode *et al.*, (2020), suggest that the doctrine of signatures might play an important role in the choice of botanicals for the prevention and management of COVID-19 infection. With the vast rich biodiversity, there is the need to explore scientifically plants for preventing and treating COVID-19.

Statement of the Problem

The sudden emergence of SARS-COV-2 disease in Wuhan city, China, in 2019, which has spread to many countries including Nigeria, requires actions aimed at curbing and managing the infection currently, there is no specific antiviral drug for COVID-19. Though vaccines have been developed, availability and hesitancy are draw back. (Akindele *et al.*,2020).

In Africa and Nigeria, reliance on plants for managing different diseases has been the practice. Africans often co-administer herbal remedies alone or combined with orthodox drugs as adjuvants and many of these plant-based medicines have since been informally repurposed by various users for COVID-19 prevention and management (Attah, *et al.*,2021). There is inadequate information on

plants and simple herbal remedies, for COVID-19. This review focused on medicinal plants with antiviral properties as potentials medicinal remedies for treatment and management of COVID-19

Methods

This paper relied solely on literature search on scientific data base, including google scholar, and information gathered from journals, commentaries and articles. Various peer-reviewed publications on traditional medicinal plants with antiviral properties, were reviewed.

Literature Review

In this review, literatures were searched from scientific database using google scholar, and pubmed.

Structure of SARS-CoV-2.

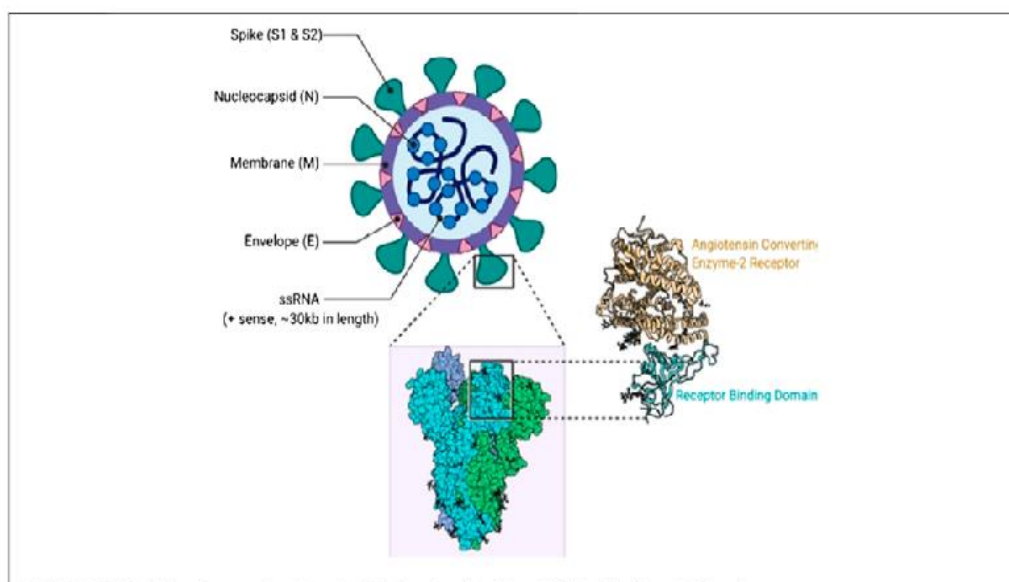


Figure 1: SARS-CoV two Structure (Cascella *et al.*, 2020). Contributed by Rohan Bir Singh. MD; Made with Biorender.com

SARS-COV-2, or severe acute respiratory syndrome coronavirus 2, is one of the viruses that belong to coronaviruses (Zu *et al.*, 2020). The common coronavirus is a positive single-strand RNA virus (+ssRNA) that belongs to the order Nidovirales, family Coronaviridae, and subfamily Orthocoronavirinae. +This specific coronavirus is divided into four genera. Each genus is further divided based on the characteristics of its subtype, genome, and phylogenetic clustering. At present, six types of coronavirus infect humans. Thus, SARS-CoV-2 has become the seventh of coronavirus that can infect humans. SARS-CoV and the Middle East respiratory syndrome coronavirus (MERS-CoV) are coronaviruses that infect humans. (Zu *et al.*, 2020). The variants of SARS-COV2 identified are; Alpha (α), Beta (β), Gamma (γ) and delta (δ). Another study indicated that this virus had a genome-sequence similarity of about 45%–90% with SARS-CoV and a lower similarity of about 20%–60% for MERS-CoV (Deng and Peng, 2020).

Coronavirus is a type of virus that has an envelope, which is round or oval and is often pleomorphic. The diameter of this virus is about 50–200nm (Zu *et al.*, 2019). SARS-CoV-2 has a unique, club-shaped spike projection on the surface of the virus, which makes this virus look like a solar corona (Zu *et al.*, 2019).

There are four major structural proteins encoded by this novel coronavirus. They are the spike (S), membrane (M), envelope (E), and nucleocapsid (N) proteins. The S protein is the most important structure that can bind with the receptor. This glycoprotein is located on the surface of the virus and mediates the attachment to the host cell's receptor

Symptoms, Mode of Transmission, Mitigation and Treatment Methods:

The symptoms of COVID-19 infection include, fever, tiredness, fever, cough, dyspnea, sore throat, lesion on lungs, aches and pain (Huang *et al.*, 2020)

The COVID-19 is known to show symptoms slowly over an incubation period of around 2 weeks. During this time the virus replicates in the upper and lower respiratory tract, forming lesions; (WHO, 2020).

The virus is transmitted mainly by symptomatic people although there are suggestions that individuals who remain asymptomatic could transmit the virus (Enyoh *et al.*, 2020). The possibility of transmission before symptoms develop seems to be infrequent, although it cannot be excluded thereby suggesting that the use of isolation is the best preventive measure for containing this epidemic.

Droplet transmission occurs when a person is within 1 m radius of an infected person, therefore is at risk of having his/her mucosae (mouth and nose) or conjunctiva (eyes) exposed to infective respiratory droplets, (WHO, 2020). However, recent studies have suggested that the virus may be transmitted beyond 3 m and therefore exposing the possibility of long distance transport of droplet (Enyoh *et al.*, 2020).

Medicinal Properties of Plants

A number of plants has been identified as powerful detoxifiers. According to Aborode *et al.*, (2020), two botanicals that are valuable detoxifiers are Neem (*Azadirachta indica*) and Turmeric (*Curcuma domestica*). Neem is a plant best known for its ability to cleanse the skin, the liver and controls blood sugar. Neem contains over 140 chemically active compounds isolated from its leaves, seeds, fruits, bark, flowers and roots and had been employed in managing many diseases (Lim *et al.*, 2021). The active compounds in neem are identified to be anti-inflammatory, anti-ulcer, anti-hyperglycemic, immune-modulator, anti-mutagenic, anti-oxidant, anti-viral and anti-carcinogenic drugs (Attah *et al.*, 2021). It gently purifies the blood and promotes healthy blood circulation. However, human cases of acidosis and renal injury have been reported, Neem extract should be avoided by pregnant women because of its abortifacient effects (Lim *et al.*, 2021)

Turmeric is the king of all spices with powerful antioxidant properties. It has an array of pharmacological effects in the treatment of arthritis, rheumatism, cancer, obesity, infections, etc. It contains curcuminoids and it is a free-radicals fighter. According to Gbadamosi, (2019) daily consumption of turmeric could prevent many degenerative diseases. Turmeric could be made bioavailable if prepared as a powder in combination with *Aframomum melegueta* (Guinea pepper). Turmeric has been confirmed to have anti-viral properties against several viruses including hepatitis virus, zika virus, as a result of its ability to inhibit gene expression (Siti *et al.*, 2020). The possible toxicity of turmeric is that curcumin and its derivatives may cause close-dependent hepatotoxicity.

Herbal immune boosters

Guava (*Psidium guajava*) leaf, mango (*Mangifera indica*) stem bark and leaf, lemon grass (*Cymbopogon citratus*) leaf, ginger (*Zingiber officinale*) rhizome, garlic (*Allium sativum*) bulb and cinnamon (*Cinnamomum zeylanicum*) stem bark are immune boosting herbs that can be prepared in powdered form or as a decoction for oral administration. Generally, spices other than pepper are rich in antioxidants, antimicrobials; they also have anticancer properties. Research has confirmed that eating a small amount of ginger (*Zingiber officinale*) daily for 11 days or more can reduce muscle pain and inflammation; ginger also aids digestion (Gbadamosi *et al.*, 2014).

Other useful spices are onions (*Allium* species), black pepper (*Piper guineense*), guinea pepper, clove (*Syzygium aromaticum*) and green onions (*Allium ascalonicum*). As an example, an immune boosting recipe by (Gbadamosi *et al.*, 2012) is as follows: Prepare a decoction of powdered turmeric (125 g), ginger (20 g), garlic (2 g), guinea pepper (a pinch), clove (a pinch), black pepper (a pinch) and coconut water (5 cups) by boiling for 20 minutes. Allow the extract to cool and filter using a fine sieve. Then add lemon (4 teaspoons) and honey (teaspoons) to the extract. Drink ½ teacup of the extract before breakfast or in between meals once daily. One preparation can last for a week if refrigerated.

Natural antioxidants

Fruits and vegetables have antioxidant properties. In addition to vitamins A and C, they contain a polyphenol (quercetin) that have strong H + donating activity. Phenolic acids generally act as antioxidants by trapping free radicals and some plant-derived compounds are better antioxidants than BHA (Butylated Hydroxyl Anisole). Consequently, natural antioxidants may be useful in the treatment and prevention of chronic infections and diseases. Some Nigerian vegetables are bitter leaf (*Vernonia amygdalina*), jute mallow (*Corchorus olitorius*), spinach (*Senecio bialafrae*), African lettuce (*Launnaea taraxacifolia*), and pumpkin plant (*Telfaria occidentalis*). The message is let food be your medicine and medicine be your food. (Aborode *et al.*, 2020).

Plant haematinics

Aborode *et al.*, (2020) reported that *Sorghum bicolor* leaf (red guinea corn) and *Theobroma cacao* stem bark (Cacao tree) are used in combination as haematinics for the treatment of anaemia, menstrual disorder and other blood-related infections and diseases. According to Uchejeso *et al.*, (2020) other haematinics include fluted pumpkin and greens (Amaranth).

Antiviral botanicals

The indigenous people of Nigeria use various plants preparation for management of viral infections. *Cassia fistula* (purging cassia), *Phyllanthus amarus* (stonebreaker), *Lagenaria breviflorus* (wild colocynth), *Citrullus colocynthis* (bitter apple) and *Syzygium aromatic* (clove) are used for the management and treatment of viral diseases (Gbadamosi, 2020). Although there is a scarcity of information on scientific validation of antiviral activity of medicinal plants, information on the antiviral activity of some of the above named is available. (Al-Awwadi, 2017). Fresh rhizome of *Z. officinale* has been proven with an antiviral effect against Human Respiratory Syncytial Virus (HRSV) infection via decreasing HRSV-induced plaque formation in respiratory mucosal cell lines. (Ikpa *et al.*, 2020). *Zingiber Officinale* (Ginger) has so many health benefits mainly attributed to its phenolic compounds. The phytochemical compounds include; linolool, citronellal, methyl gingerdiol, terpenes, borneol, limonene and gingerdiacetale (Al-Awwadi, 2017). Report of screening of gingerol against some replication protease of SARS-COV-2 indicated the potential ability of ginger to serve as one of

the remedies for COVID-19 (Thirumalaisamy *et al.*, 2020). The possible toxological effect of excess intake 250mg/kg can lead to hypotension.

Antimalaria and analgesic herbs

Chincona officinalis (red cinchona) stem bark, *Nauclea latifolia* (African peach) root, *Alstonia boonei* (stoolwood) root, and *Morinda lucida* (brimstone tree) root and leaf are used as antimalaria remedy. *Chincona officinalis* and other *Chincona* species contain quinine (hydroxychloroquine and chloroquine) and other alkaloids that are effective for the treatment of malaria fever. *Microdesmis puberula* and *Calliandra portoricensis* (powderpuff) are used as analgesic in malaria, arthritis and rheumatism. (Uchejeso *et al.*, 2020).

Herbal cough remedy

Garcinia kola (bitter kola) and *Bryophyllum pinnatum* (miracle leaf) are used traditionally for the treatment of cough. *G. kola* contains alkaloids, saponins, tannins, flavonoids, glycosides, sterols and phenols (Uchejeso *et al.*, 2020). The anti-viral compound in *G. kola* is kolaviron which is reported to suppress influenza virus (Uchejeso *et al.*, 2020). There is speculation that high doses of kolaviron can cause liver damage. However, report of the use of *G. kola* during COVID-19 are helpful and encouraging. *G. kola* seeds are soaked in lemon juice in a bottle. One teaspoonful of the remedy is taken three times daily after food. The leaves of *B. pinnatum* are infused in hot water to make it and squeezed, then honey is added to the leaf juice (Gbadamosi, 2019).

Herbs for respiratory tract infections

Several plants are used in different localities to treat respiratory tract infections. These plants include: *Allium sativum*-Garlic, Ginger – *Zingiber officinale*, Eucalyptus, Lemon grass (*Cymbopogon citratus*) *Spondias mombin* (yellow mombin), *Garcinia kola*, *Calotropis procera* (apple of Sodom), *Nymphaea lotus* (water lily) and *Abrus precatorius* (water leave) are used for the management and treatment of respiratory tract infections. *Alium sativum* (Garlic) is famous for its use to treat several conditions such as respiratory infections. Its main active ingredient is 'allicin'. Many studies has shown that, garlic has antioxidant, anti-inflammatory, antifungal, antiviral, antivaterial, antihypertension and antithrombic properties (Uchejeso *et al.*, 2020). Molecular docking of allicin against protease of SARS-COV-2 shows that it is a potential inhibitor for replication of viruses (Siti *et al.*, 2020). The possible toxicity is using higher dose over a prolonged period which may lead to liver and kidney damaged (Siti *et al.*, 2020).

Medicinal plants with antiviral properties

Nigerian plants have shown to house a number of novel compounds with antiviral activities (Oladele *et al.*, 2020). A number of scientific researches have elucidated the curative mechanisms by which these plants provide their therapeutic actions while clinical research has presented the ability of some medicinal plants in treating many viral infections and diseases. For instance, *Sida cordifolia* has been reported to be a natural anti-human immunodeficiency virus (HIV) agent (Uchejeso *et al.*, 2020). Other plants with anti-retroviral activities include: Aloe vera, lime, lemon, *Boerhavia diffusa*, *Echinacea* species, *Phyllanthus* species, *Andrographis paniculata*, *Astragalus membranaceus*, *Borreira*, *Licorice*, (*Glycyrrhiza globa*, Sage plants (*Solvia officinalis* L).

Aloe vera leaves and gel have been reported to have antiviral, anti-inflammatory and antibacterial properties. *Aloe vera* contains anthraquinone derivatives like alo-emodin, emodin and chrysophenol. Ambrish *et al.*, (2020) reported the potential inhibition of *Aloe vera* extracts against SARS-COV-2.

Lime (*Citrus aurantifolia*) and Lemon (*C. limonum*): extracts of lime and lemon pulp revealed the presence of alkaloids, cardiac glycosides, steroids, flavonoids, tannins, proteins and reducing sugars. Lime extracts exhibit antibacterial, antiviral and antioxidants activities (Uchejeso *et al.*, 2020).

Potential Herbal Remedies for Coronavirus treatment

Reports for traditional herbal medications against COVID-19 have been documented in Thailand, India, Bolivia, and Tunisia, China, (Attah *et al.*, 2021, Islam *et al.*, 2020).

In Madagascar, the use of herbal medicines as antivirus has been legalized and produced in large quantities. This herbal remedy known as COVID Organics (CVO) is used for the prevention and cure of COVID-19, (Attah *et al.*, 2021). *Artemisia* from which (CVO) is produced from is known to be potent and used for malaria treatment (Malatere *et al.*, 2020).

In Nigeria, there are several claims of symptomatic treatment, cure or prevention of COVID-19. Some of these claims are currently under scientific investigation for adverse effects and efficacy. (Attah *et al.*, 2021). The Nigerian government has not approved or authorized the use of any indigenous phytomedicine to combat COVID-19, reason being that no herbal remedy currently claimed to prevent, manage or cure the infectious disease has been taken through a rigorous scientific investigation via clinical trials. Meanwhile, the National Agency for Food and Drug Administration and Control (NAFDAC) is now processing not less than 21 herbal formulations for "safe use" under listing status. (Akindele *et al.*, 2020).

According to NAFDAC, some of these have been claimed to boost immunity with a parallel anti-infective activity capable of providing relief to symptoms associated with COVID-19. (Attah *et al.*, 2021). Some herbs cultivated in Nigeria which include: Neem tree (*Azadirachta indica*) Ginger (*Zingiber officinale*), onions (*Allium cepa*), Garlic (*Allium sativum*), Echinacea, Euphorbia hirta, *Garcinea kola*, Turmeric (*Curcuma longa*), *Aleo vera* and Olive (*olea europaea*), have been reported to contain compounds capable of inhibiting a variety of viruses (Ikpa *et al.*, 2020). A summary of the bio-active compounds and their antiviral properties are indicated in table 1. (Ikpa *et al.*, 2020)

Table 1: Potential Plants, compound of interest and some therapeutic history

S/N	Plant	Compound of Interest	Some therapeutic history
1	<i>Zingiber officinale</i>	Gingerol Shogaols	Human respiratory syncytial virus
2	<i>Allium Cepa</i>	Quercetin	Human immunodeficiency virus (HIV)
		Isorhamnetin	Herpes simplex virus type 1
		Kaempferol	Poliovirus type 1
		Myricetin	Para-influenza virus type 3
			Potato virus
3	<i>Allium sativum</i>	Allicin	Influenza
4	<i>Enchinacea</i>	Caffeic	Cold and influenza, lungs conditions, wound healing candidiases, Influenza. A virus herpes, simplex virus, polio virus

5	<i>Eupobia hirta</i>	Afzelin Myricitrin. Rutin garlic acid, caffeic acid	Quercitin	Asthma conjunctivitis
6	<i>Garcenea kola</i>	Kolaviron		Influenza virus hepatitis diarrhea laryngitis bronchitis and gonorrhea – colic, chest cold and cough
7	<i>Curcuma longa</i>	Curcumin		Dengue virus hepatitis C virus zika virus, chikungunya viruses
8	<i>Aleo vera</i>	Emodin chrysophanol aleo- emodin		Human respiratory syncytial virus
9	<i>Olea europaea</i>	Oleuropin		Herpes mononucleosis hepatitis virus rota virus, bovine rhinovirus canineparvovirus feline leukaemia virus, respiratory syncytial virus parainfluenza type 3 virus

Table 2. Selected antiviral Angiosperm plants of African origin and the major class of phytochemicals present based on widespread used and documented evidence (Attah *et al.*, 2021)

S/N	Plants	Class of phytochemicals present	Identified phytochemicals with antiviral activity	Indications	Country
1	<i>Achyranthes aspera</i> L. (Amaranthaceae)	Flavonoids, alkaloids, terpenoids	Oleanolic acid	HSV-1 HSV-2 HIV-	Africa, south Africa
2	<i>Adansonia digitata</i> L. (Malvaceae)	Phenolics	Nil	HSV-1	Nigeria Senegal
3	<i>Andrographis paniculata</i> (Burm.f.) Nees (Acanthaceae)	Diterpenoids, flavonoids, polyphenols	Andrographolide	HSV-1 SRV EBV	Nigeria
4	<i>Aspalathus linearis</i> (Burm.f.) R.Dahlgren (Fabaceae)	Phenolics	Aspalathin nothofagin isoorientin orientin quercetin luteolin	HIV influenza	South Africa
5	<i>Azadirachta indica</i> A. Juss. (Meliaceae)	Carbohydrates	Polysaccharides P ₁ and P ₂	PV-1	African countries
6	<i>Bulbine frutescens</i> (L.) Willd. (Xanthorrhoeaceae)	Phenolics, alkaloids, flavonoids	Myricitin xanthohumol	HIV-1	South Africa

			scutellarin methoxyflavone		
7	Canavalia ensiformis (L.) DC. (Fabaceae)	Protein	Lectins (Concanavalin A)	HSV	Nigeria Africa
8	Nigeria Africa	Phenolics Tannins Flavonoids	Catechins myricetin	EBV CMV HIV-1	Kenya
9	aCombretum micranthum G.Don (Combretaceae)	Phenolics, tannins Flavonoids	Catechin (catechinic acid cinnamtanins pavetanins AOCA(Alkaline auto-oxidized catechins)	HSV-1 HSV-2 HIV-1	Nigeria
10	Echinacea purpurea (L.) Moench (Compositae)	Phenolics, Alkamides	Cichoric acid	HIV HSV Influenza	South Africa Zimbabwe
11	Glycyrrhiza glabra L. (Fabaceae)	Triterpenes (saponins), flavonoids	Glycyrrhizin and its derivatives liochoalchone, isolicoflavonol, glycocoumarin, glycyrrhizoflavone, licopyranocoumarin	HSV-1 HIV	South Africa
12	Macaranga barteri Müll. Arg. (Euphorbiaceae)	Phenolics (stilbenes)	Vedehenin	EVb	Nigeria
13	Musa acuminata L. Musa spp (Musaceae)	Protein		Anti-HIV	Nigeria, tropical Africa
14	Oldenlandia affinis (Roem. and schult.) DC. (Rubiaceae)	Peptides	Cyclotides	HIV	Dr. Congo
15	Papaver somniferum L. (Papaveraceae)	Alkaloids	Papaverine	HIV-1	Nigeria
16	Rapanea melanophloeos (L.) Mez (Primulaceae)	Flavonoids	Quercetin	Influenza A	South Africa

17	Zingiber officinale Roscoe (Zingiberaceae)	Terpenoids	Beta sesquiphellandrene	RhV RSV	Nigeria
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HIV–Human Immunodeficiency Virus; HSV 1–Human Simplex Virus one; HSV 2–Human Simplex Virus two; RhV–Rhinovirus; RSV–Respiratory Syncytial Virus; EBV–Epstein-Barr Virus; CMV–Cytomegalovirus; VV–Visna Virus; DV–Dengue Virus; SRV–Simian Retrovirus; PV-1 -Poliovirus type 1. As a part of the seven Keys preparation, it is used to treat small-pox, chicken pox and measles.

Conclusion

In this review, several studies have revealed that some medicinal plants, used for treating respiratory infections are potential candidates for prevention, management and treatment of COVID-19. These plants include; bitter kola, ginger, *Aloe vera*, garlic, turmeric, guava, lime, lemon and Neem. The antiviral effects of the combination of the herbs can be explored for SARS-COV-2.

Recommendations

Based on the literature reviewed, the followings are recommended:

1. Use of plant-based products as potent anti-COVID-19 herbal remedies be employed in prevention and management of COVID-19.
2. Indepth scientific investigation should be carried out on the bioactive components of the medicinal plants to establish their pharmacological values.
3. The toxicity assessment of medicinal plants is necessary to ascertain their safety for human consumption.
4. Traditional herbal medicine should be integrated into western-based health care to achieve desired synergy.

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