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Respiratory Tract Protective Herbs May Serve As Palliatives in the Battle Against COVID-19 Pandemic

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Abstract

COVID-19 as of now has no known treatment protocol and or vaccines and as such continues it deadly grips on humans. Many people across the globe have died and are dying as there is no end to the virus in sight. Health systems in different countries are failing, making people to turn to self-help amidst COVID-19 pandemic. Traditional medicines were used to tackle deadly diseases before the development of medical interventions. Herbal medicines have been used to either cure lungs disease or to protect the body from varying infections. The lung is the site particularly affected by COVID-19 when infected by SARS-CoV-2 leading to respiratory distresses, or death. This article aimed at refreshing the minds of readers on respiratory tract protective herbs, which may serve as temporary interventions in the battle against COVID-19. Articles relating to herbs with potentials to protect respiratory tract against diseases were reviewed concisely. Literatures suggested that bulk of herbs exist and could aid in the fight against COVID-19 while some are yet to get scientific backings. The symptoms of COVID-19 include: difficulty in breathing, sneezing sore throat, cough, headache, flu, e.t.c. The mixture of any named herb can ameliorate the pains of COVID-19 patients as each has it specific healing properties. The healing powers of known and unknown, local or synthesized herbs have been found to alleviate associated COVID-19 symptoms. We therefore recommend synergy of herbs for treatment of COVID-19 or as palliatives pending the realization of a definitive treatment protocol.

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Introduction

Severe acute respiratory syndrome - Coronavirus - 2 (SARS-CoV-2), from coronavirus family is a zoonotic infection occurring between bat and humans responsible for the overwhelming COVID-19 pandemic that is ravaging the world as of now (Ysrafil *et al*., 2020). SARS-CoV-2 infection is capable of gaining entrance into humans via receptors ACE2, which occur in different organs of the body especially lungs from where facilitation of viral entry into target cells occurs. This process is initiated by attaching S glycoprotein to the receptor, which is the Angiotensin-converting enzyme 2 (ACE2) in the host cells just like what happens in type II pneumocytes occurring in the lungs (Rabi *et al*., 2020). Soon as the virus enters a living host, it comes in contact with the mucous membranes that line the nose, mouth, and eyes from where it enters a living cell and multiplies. It has been established that COVID-19 initiate responses that lead to pneumonia as well as acute respiratory distress syndrome then pulmonary thrombosis (Astuti *et al*., 2020). In this scenario, blood clots serve as blockage in the air sacs of the lungs thereby preventing free flow of oxygen in the lungs and alveoli. Also, there is reduced blood oxygen carrying capacity (hypoxemia), which further worsens the condition (Huang *et al*., 2020). Advanced stages of COVID-19 disease can be life threatening as there is injury to the lungs due to scar tissues, which often remain unresolved. As at the time this paper is being reported, SARS-CoV-2 has infected over 10.7million people, while more than 5.9M have recovered fully and death toll surpassed 516,000 across 216 countries globally (WHO, 2020). United States of America has recorded over 130,000 deaths being the worst hit by the deadly infection compared to Nigeria with more than 590 fatalities so far with no end in sight. In order to reduce death rates, many countries result to using ventilators, which is not an ultimate cure rather it only assists the failing lungs by flooding in more oxygen to compete

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with the glycoprotein binding to the heme-globin, which helps to take oxygen from the lungs to other parts of the body. At present there is no known treatment protocol or vaccines for the prevention and management of COVID-19 pandemic (Wong *et al.*, 2020). Development of a vaccine may take longer than anticipated considering the target of every vaccine, which is to elicit polyclonal antibody responses usually to antagonize the spikes of protein originated from it host (SARS-CoV-2) in order to neutralize infections elicited by the virus in addition to the steps involved before embarking on clinical trials (Ruklanthi *et al*., 2020). There is therefore urgent need for medicinal palliatives while we await a permanent solution in form of a vaccine or therapeutic regime in the current battle against COVID-19. Herbal exploitation is highly desirous at this time taken into cognizance the urgency and fatalities currently encountered world-wide. This article therefore, aimed at creating awareness on the possible respiratory protective herbs that may be explored as palliatives in the fight against COVID-19; while we expect a breakthrough in vaccines as well as organization of a well-established treatment protocol. Another goal is to enlighten readers on medicinal plants that strongly support the immune system, as well as eliciting anti-inflammatory and anti-coagulatory impact in the lungs thereby alleviating the plights of COVID-19 patients and further reduce unforeseen complications.

Protective Medicinal Herbs against Respiratory Disorders

Before now our forefathers are known to have used herbs in the treatment of several infections and disease conditions. Some of these herbs have shown to have had therapeutic, curative and protective effect on various organs, even before the advent of orthodox medicine. Many of the local herb extracts have proven to be of protective capacity against upper and lower respiratory tract infections and diseases. Some of the listed herbs have been reported by researchers and scientists to have both protective and curative properties while research is ongoing on others, which include but not limited to the following:

***Zadirachta indica* (Neem)**

Neem has been in use for ages as a medicinal plant in the treatment of pulmonary diseased tissues and respiratory disorders (Koul *et al.*, 2012). The stem bark of Neem has been proven to have anti-viral properties, demonstrated against coxsackievirus and herpes simplex virus (Tiwari *et. al.*, 2010). Phytochemical composition suggests that alkaloids were rarely present in aqueous samples of stem-bark, root and leaf whereas glycosides were undetectable in leaf samples using ethanol extraction and aqueous extracts (Nwali *et al.*, 2018). In the same report, quantitative analysis revealed the presence of alkaloids in the root, stem-bark and leaf but is more concentrated than glycosides, tannins, flavonoids and saponins respectively. Nwali *et al*., (2018) also observed that the percentage of phytochemical compositions in the stem-bark is far higher than other component parts of the plant except alkaloids in the leaf where it was found to be greater. In addition, the plant contains diverse medicinal metabolites serving as the main ingredients: nimbin, nimbanene, nimbandiol, nimbolide, ascorbic acid, 6-desacetylnimbinene, n-hexacosanol and amino acid, 7-desacetyl-7-benzoylazadiradione, 7-desacetyl-7-benzoylgedunin, 17-hydroxyazadiradione, and nimbiol (Hossain *et al*., 2011). It was also revealed that Neem acts as free radical scavenging properties due to its rich source of antioxidant (Kumar *et al.*, 2020). Going by the anti-viral properties and vast influences on pulmonary health, Neem may be used as palliatives for combating COVID-19 as there is no fixed treatment regime for now.

Cnidium monnieri (Shecuangzi)

This is a popular plant commonly called Shechuangzi, Osthole, Jashoshi, fruits of Cnidium in English and it popularity has been tested in the Southwest region of Nigeria. Osthole is a plant often used as anti-allergy and anti-inflammatory by traditionalist. This plant will be desirous in the treatment or management of COVID-19 going by its anti-inflammatory properties. In another report, Kwak and Lim (2014) worked extensively on the plant, which was found to have protective effects on pulmonary tissues of mice. The active ingredient in the plant is called osthole while the mechanism of action suggests that osthole is known to be highly selective while exerting its inhibitory effects mostly on "5-lipoxygenase (5-LO) and cyclooxygenase-(COX-)" respectively. When it comes to reprising inflammation in cells, tissues or systems of the human body, the aforementioned enzymes (5-lipoxygenase and cyclooxygenase) collectively play an inhibitory role, which makes the effect critically exhibited but particularly on the inhibition of COX. This action is shown to alleviate pains and relieves inflammation and its corresponding indications (Resch *et al.*, 1998).

***Juglans regia* (Walnut)**

The nut harvest from this plant is commonly called Walnut while the leave is widely reported to be rich in flavonoids, tannins, saponins, alkaloids and polyphenols (*Pitschmann et al.*, 2014). In a report by Qamar and Sultana (2011), polyphenol is copiously available in the kernel and is said to be the active

ingredient in *J. regia* plant. It was found to possess protective properties and ease oxidative stress including prevention of lung injuries caused by "modulate cigarette smoking and induced acute inflammation" in Qamar and Sultana (2011). Walnut was also found to have inhibitory effect on inflammatory responses in the lungs and alleviate pains within the respiratory tract (Qamar and Sultana, 2011).

Stemona tuberose (Baibu)

This plant is commonly called Baibu of wild asparagus in English without a known indigenous name. Lee *et al.* (2014) researched on the inhibitory impact of *S. tuberose* action on lung inflammation which was conducted on some cigarette smoke-induced mouse model for a limited time. The result of the sub-acute exposure was found to have both inflammatory and inhibitory responses in both developing and matured lungs in experimental mouse. In the initial phase of the research, water extraction of *S. tuberose* was conducted at 60 minutes at a temperature of 100°C. In continuation, leftover herbs including the impure substances were both separated by filtration technique to obtain the pure form of the extracted liquid. The process however followed a spray drying process of the liquid extract in addition to corn starch, which was met to serve as a stabilizing agent in the herbal products. Also, it has been widely reported that the active ingredient in the plant is known as Stemo alkaloid, which by its medicinal action acts by inhibiting the elevation of numerous inflammatory cells like those of the macrophages, neutrophils, and lymphocytes, and also causes reduction in the magnitude of pro-inflammatory cytokines like the TNF-α and IL-6 and the chemokine as well as keratinocyte chemo-attractant (KC), which functions collectively or independently (Ramesh *et al*., 2013).

***Plantago major* (Greater plantain)**

P. major is distinguished for its ability to colonize and encompass a compacted and disturbed soil even in the face of a continuous trampling; the plant still finds a way to survive. The contents of greater plantain leaf include: triterpenoids, phenylethanoid glycosides, phenolic acid polysaccharides. "Greater plantain leaf is a green, weedy plant native to Europe, Asia and North America, which have been relieving health afflictions for millions of years (Lee and Harrod, 2010). The major components of Greater plantain are believed to reduce irritation, curb effects of harmful organisms, and alleviate respiratory troubles. It is used in modern medicine and can be found in balms and medication meant for smoothing the respiratory system (Najafian *et al*, 2018). A trial was conducted in Germany clinically in respect to the anti-coughing and anti-irritability of the lungs when exposed to *P. major* leaf. It was discovered that the leaf of Greater plantain that is seen as a common plant and usually thrown off after eating the produce itself possessed ameliorating effects against lung irritation and itching and the impact was also felt in its ability to curtail cough (Najafian *et al*, 2018). However, the literature did not specify which type of cough (dry or wet), which however, resulted to the widely accepted use of the plant as one of the major ingredient added to respiratory tract herbal solutions in many parts of Africa including Nigeria and some areas in Europe. The active substance contained in plantain leaf extract that enables the inhibition of mast-cells degranulation has been scientifically proven to be phenylethanoid and may be utilized in the treatment of allergies and asthma diseases (Ikawate *et al*., 2001; Najafian *et al*, 2018). This has led to its broad adoption as an essential ingredient in many European and Africa respiratory medications. Phenylethanoid as an active ingredient is present in all species of Greater plantain, which helps in the protection of lungs and bronchi and against invading bacteria demonstrated in mice such as those causing pneumococcal infection and mostly in treating bronchitis of a chronic origin (Najafian *et al*, 2018).

***Schisandra chinensis* (Miracle fruit)**

In Nigeria *S. chinensis* is a typical herb that is widely cultivated across the south western states. The extract or decoction of the miracle fruit is commonly used for managing lung disorders by the Asian trado-medical practitioners and is still being used as a treatment option in that region (Szopa *et al.*, 2017). Locally prepared decoction was found to have inhibitory properties against acute and chronic inflammatory conditions particularly in the lungs and is useful in the treatment of dry or wet cough, which makes it highly desirous in the management of COVID-19 patients. In another development, the fruit extract of *S. chinensis* was investigated by Zhong *et al.* (2015) for the treatment of cough and pulmonary inflammation, which they demonstrated on hypersensitive cough induced guinea pig; wherein the cough hypersensitivity was induced by exposures to cigarette smoke (Zhong *et al*., 2015). The result however proved that *S. chinensis* has anti-cough healing properties and is capable of reversing inflammation within the pulmonary. It was further reported that the active agent in *S. chinensis* is a substance called ligan. Ligan promotes decrease in airways hyper-receptivity of immunoglobuline E level and immune cell infiltration in mice, which has been demonstrated on asthma related offenses. It was also revealed that the fruit extract is often useful as alternative or complementary traditional treatment therapy in place of glucocorticoids used in modern medicines (Kim *et al.*, 2014). Ligan therefore, can be

obtained in a large quantity for the production of herbal treatment options in combination with other herbs in the current fight against the symptoms of COVID-19.

***Lobelia erinus* (Trailing Lobelia)**

Lobelia is purple-flowered herbal medicine which is commonly known as Indian tobacco and as sun shade in Nigeria. In Appalachian, Lobelia is purple-flowered herbal medicine that is commonly used traditionally, which helps to alleviate the plight of those suffering from asthma of the bronchial. Lobeline is a known rich alkaloid derivative commonly used to ameliorate running nose, ease nasal congestion and relax mucus in the chest region (Cupido and Conrad, 2001). However, due to the anti-spasmodic healing properties and quality, lobelia is often prepared for the treatment of bronchitis and associated problems within the bronchi region as well as to ease breathlessness and is sold as common fever medicine that can be obtained across the counter. The leaves and seed pods are the most commonly used medicinal parts of *Lobelia and* have shown to have "anti-asthmatic, anti-spasmodic, anti-emetic, expectorant, and respiratory stimulatory effects" (Robert *et al.*, 1996). In addition, α-Lobeline is the most biologically active and frequently investigated alkaloid in *Lobelia* out of the more than 20 piperidine alkaloids that have been identified. α-Lobeline has been indicated as a partial nicotine, which serves as agonist by exerting actions on the central nervous system including the neuromuscular system with peripheral circulation in humans. It is also known as a strong respiratory stimulant activating the carotid and aortic body chemoreceptors in human (Leung and Foster, 1996). α-Lobeline relaxes lung tissues and aids in expectoration while little amount is required in stimulating respiration and expectorant activities. Lobelia has been used with success in an array of respiratory conditions including asthma, chronic pneumonia, bronchitis, and laryngitis (Felpin and Lebreton, 2004).

***Eucalytus globulus* (Eucalytus)**

The plant *E. globulus* is called gum tree or ever green in English. It is a tail plant with different species particularly grown all over southeastern Australia. The stem bark is mostly smooth with small leaves, which often appear as white in colour and waxy on the lower surface. Further descriptions suggest that the adult leaves may appear as glossy green having lance-shape, glaucous and arranged in a single flowing buds. Sometimes it is arranged in clusters of around three to seven with white flowering parts or woody fruits wrapped in leaf axils (Santos *et al.*, 2011). The active ingredient in this plant is 1, 8-cineole eucalyptol and has shown to inhibit nitric oxide with a concomitant pro-inflammatory effect, exhibited in animal models (vigor *et al.*, 2004). Eucalyptus has been discovered to have healing properties, which are well established among communities of the aborigine as well as the locals in Australia. Eucalytus oil is an excellent herbal medicine containing eucalyptol in quantities and is the only natural compound that serves as a major constituent in eucalytus oil. It is very helpful in dilating bronchioles in human lungs, clearing nasal congestion along the passages, and helps in melting some of the gluey mucus-like substances often found in human respiratory systems. It also helps to treat inflammation like sinusitis and bronchitis and serves as a remedy for fever and bronchial asthma (Burkill, 1985). Eucalyptus oil is highly suggestive of antibacterial effects on pathogenic bacteria residing in the upper respiratory tract, including *Haemophilus influenzae*, a bacterium answerable to a range of infections, and some strains of *streptococcus*. The fresh leaves have been recommended for use as herbal remedies against sore throat, sinusitis, and bronchitis. The oil vapor appeared to act as a decongestant upon inhalation and is reportedly used as home remedy for bronchitis and common cold while the anti-fungal effects of the plant's oil have been established against diverse fungal species (Marthin *et al.*, 2013).

***Pulmonaria officinalis* (Lungwort)**

This plant is commonly known as Jerusalem-sage, Jerusalem cowslip or blue lungwort. There is no local name for it in Nigeria. Jerusalem-sage has shown to possess human-like tissue which is very effective medicine for respiratory disorders. Modern theories and antioxidant effect has proven that lungwort possesses secretolytic and antioxidant effect that is beneficiary in boosting and giving relief to respiratory disorders (Hawrył and Waksmundzka-Hajnos, 2013). The extract of Jerusalem sage contains yunnaneic acid B which is an isolate from *Salvia yunnanensis* and large amounts of rosmarinic acid. Herbal sources have indicated that infusion of *lungwort* are given as severe anticoagulant, inflammatory and possesses anti-oxidative effects (Pielesz, 2012). It has proven to be highly effective against bronchitis, tuberculosis asthma and cough (Ivanova *et al.* 2005; Akram and Rashid, 2017).

***Inula helenium* (Elecampane, horse-heal)**

Elecampane also known as horse-heal in English and commonly used by the Chinese, Indians, Romans and the Greeks to soothe and relax tracheal muscles. Elecampane has shown to contain two major contents (Inulin and alantolactone). Inulin helps to soothe the tube of a swollen and red bronchial that causes pain when breathing while alantolactone cleanses

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congestion to make breathing easier (Varier, 2002; Khare, 2007). The root of horse-heal is known to have rich phenolic compositions and has anti-inflammatory properties due to its synergistically focusing key targets for signaling pathways by inducing inflammatory responses. It is also known to be useful food additives, serves as natural food and as an antioxidant (Spiridon *et al.*, 2011).

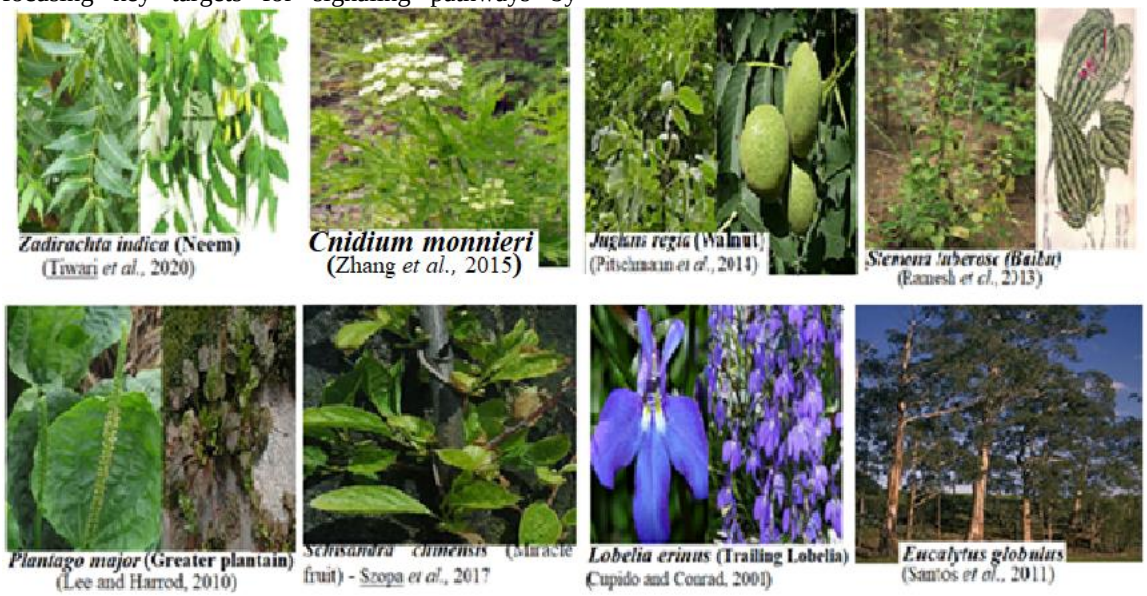

Figure 1: *Z. indica* (Neem or Dogoyaro); *C. monnieri* (Fruits of Cnidium or Osthole); *J. regia (*Walnut*); S. tuberose* (Baibu or wild asparagus); *P. major* (Greater plantain); *S. chinensis* (Miracle fruit); *L. erinus* (Indian tobacco) and *E. globulus* (gum tree or evergreen).

***Mentha peperita* (Peppermint)**

Peppermint is the English name for this plant and is commonly called ewe mint in the Southwest, Nigeria. It is known to contain menthol, which helps in calming respiratory tract. Menthol also helps in decongesting the respiratory airways. Peppermint has the ability to decongest and is known for shrinking nose with swollen membrane that helps to ease breathing. Peppermint also has the ability to loosen mucus from the lungs (Burkill, 1985). Apart from using peppermint for medicinal and therapeutic purpose, it is widely used as tea infusion, herbs, spices for cooking delicious meals, and serves as flavoring or aromatic agent for different preparations (Mohammad *et al.*, 2019). In addition, it can act in synergy with other medicinal plant to ameliorate the plight of COVID-19 sufferers particularly as the menthol content helps to relieve and soften mucous in the respiratory tract thereby decongesting the airways.

***Ligusticum porteri* (Osha Root)**

The plant *L. porteri* is a medicinal plant commonly called mountain carrot, Indian root, colorado cough root and love root. Herbs produced from Osha root has shown to contain saponin, amphor, oil and phytosterols. These constituent are the ingredients that make Osha root as one of the strongest lungs function remedy (Burkill, 1985). The root promotes blood circulation from other parts of the body to the lungs, which makes it easier to breathe clearly. The anti-histamine content in the plant's root serves as great benefit in calming and soothing respiratory functions. The plant is known in history to have hailed from Native Americans when emerging from winter hibernation, illnesses or when wounded. Among native Africans and Americans, it is commonly used in the treatment of flu, influenza, bronchitis, pneumonia, and cough (Burkill, 1985). Camphor, Saponin and Phytosterols content as anti-inflammatory actions help to reduce mucous membrane blockage and ease bronchial airways (Cowen, 1990).

Tylophora asthmatica

In English *T. asthmatica* is commonly known as swallow wort seed and anathamul and the leaves have been used repeatedly as herbal remedy in aiding respiratory functions and have proven to be very potent. In a clinical trial involving 135 patients with symptoms of respiratory disorders, patients who consumed 200mg twice a day prescription of tylophora for 6 consecutive days have shown obvious and great respiratory improvement and relieve in a 2week treatment plan (Gupta *et al.*, 2011). The plant alkaloid has phenanthroindolizidine, which is used as bronchodilator, emetic, expectorant and diaphoretic. The tylophorine alkaloid content has

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phenanthroindolizidine structures and is highly effective as anti-allergic, anti-inflammatory and inhibits mast cell degranulation (Gopalakrishnan *et aI.*, 1980).

Adhatoda vasica

The plant *A. vasica* is also known as Vasaka or Malabar nut in English and offers respiratory health support in patients with respiratory distress (Dry and Vincent, 1991). Studies performed over the last years have revealed that the vasicine, alkaloid and vasicinone (quinazoline ring derivatives) content in the leaves help to improve respiration and are regularly used in the treatment of respiratory ailments (Chakrabarty and Brantner, 2001). Studies have also shown that Vasicine content in Malabar plant at a low concentration can help in relaxing respiratory muscles, dilating the bronchi and at high concentration can serve as protection against bronchospasm caused by histamine intoxication (Chakrabarty and Brantner, 2001).

***Ocimum sanctum* (holy basil)**

In Nigeria *O. sanctum* (holy basil) is grown everywhere and particularly among the South western cultural ethnic group. This plant is known as scent leaf or holy basil in English and is said to possess immune-supportive properties with maximum support for cardiac (heart) health including ability to enhance effective respiratory functions in human (Dry and Vincent, 1991). In another development, it was reported that scent leaf (holy basil) has protective potentials against some infections by improving immunity of the body (Pavaraj *et al.*, 2011; Chitra *et al.*, 2011).

Glycyrrhiza glabra

The plant is locally known as Oburunbebe or banga stick in Nigeria and has shown potency in combating inflammation and allergies including support for bronchial functions (Dry and Vincent, 1991). The active ingredient in Banga stick is glycyrrhizin and glycyrrhetinic acid with potent cortisol metabolism due to the possession of steroid-like structures. The root is excellent in treating common cough, pulmonary diseases, bronchial asthma and cold (Roshan *et al.*, 2012). The constituent glycyrrhizin helps to alleviate allergic asthma in an induced ovalbumin experimental mouse asthmatic model (Roshan *et al.*, 2012).

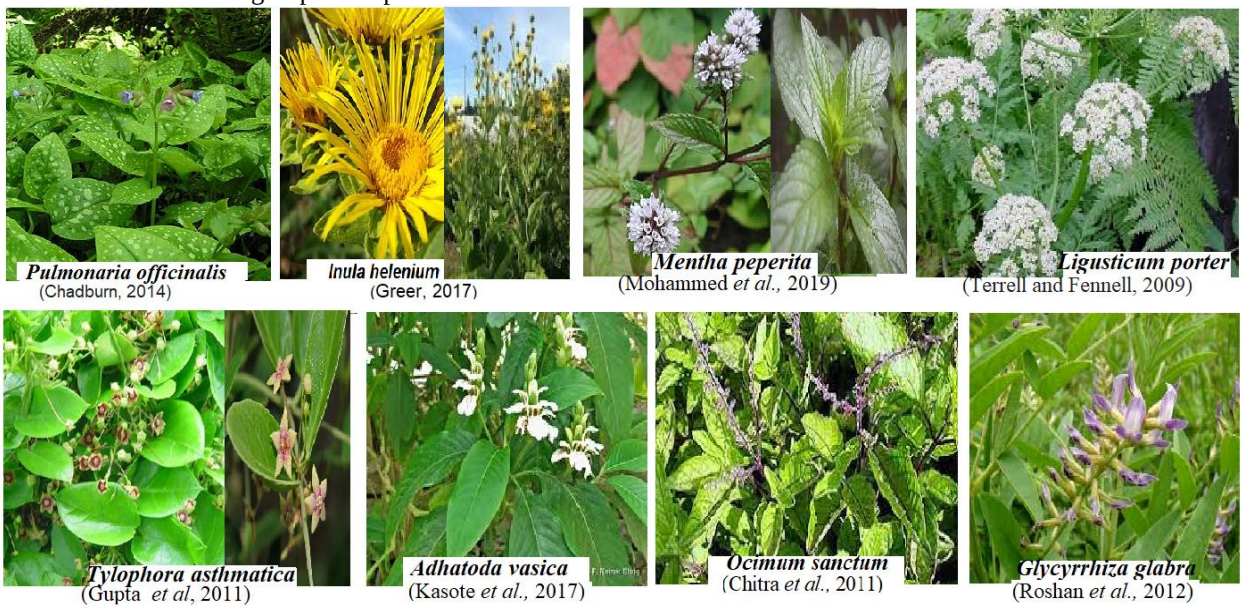

Figure 2: *P. officinalis* (Lungwort); *I. helenium* (Elecampane); *M. peperita* (Peppermint); *L. porter* (Osha Root); *T. asthmatica* (swallow wort seed); *A. vasica* (Vasaka or Malabar nut); *O. sanctum* (holy basil) and *G. glabra* (Oburunbebe or banga stick).

***Nigella sativa* (Black seed Oil)**

The plant *N. sativa* is from the Ranunculaceae family, which features as a medicinal and ornamental plant. It flourishes as a native flowing plant within the mediterranean and northern Africa including the Indian Sub-continent, and West Asia regions (Adib-Hajbaghery and Rafiee, 2018). Studies have revealed that Black seed oil help to reduce the effect of allergen on the lungs by decreasing deposits of collagen, expression of TGF-β 1, FGF2, and VEGF in the lungs of asthmatic rats. This study has shown that lungs asthma can be treated by remodeling in the future (RazaAsim, 2010).

***Cymbopogon citratus* (Lemmon grass)**

In India *C. citratus* is often used mostly as fragrance and sometimes for medical treatment of certain

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diseases (Blanco *et al*., 2009). In Brazil it is prepared as tea and administered orally for the treatment of anxiety while in some countries it is brewed and consumed as tea in order to boost immunity (Bleasel *et al*., 2002). Lemon grass is extensively used as traditional remedy due to the healing potentials in the treatment of flu and cough (Manville and Abbott, 2018). Vitamin-C content in lemon grass is the active ingredient and can be used alongside with other important components of the plant to improve lungs function, which has proven to have relief for nasal blockage, flu and bronchial asthma respectively (Manville and Abbott, 2018).

Allium sativum (Garlic)

In English *A. sativum* is known as garlic and is popular in every home in Nigeria and is regarded as a basic household ingredient used for cooking delicacies. The bulb is the most widely used part of the plant all over the world and is a known herbal herb in most countries as it is being used traditionally as anti-hypertensive, anti-diabetic and antibiotic remedy. Garlic also serves as blood thinner in preventing blood clot (Aiyeloja and Bello, 2006) and can therefore be used in the prevention of pulmonary embolism, which is believed to be the end stage of COVID-19 destructive prowess in humans.

***Zingiber oficinale* (Ginger)**

In English *Z. oficinale* is commonly called ginger and is grown almost in every household in Nigeria with more than one name depending on the region. The family name is known as Zingibercenae and corm is the most commonly used part of the plant. It is known to be very potent in liver detoxification, and relieves inflammation on the lungs such as bronchitis (Aiyeloja and Bello, 2006). Ginger is also rich in zinc which can help in preventing viral or bacterial replication and boost the immune system. It can therefore act in place of zinc especially as the cost has sky rocketed due to popular demand for zinc sulphate.

***Curcuma domestica* (Turmeric)**

In English *C. domestica* is called turmeric, which is a universal name and is known for its numerous pharmacological remedies such as prevention and relieve of inflammation (Prabhakaran, 2013). This is also the reason why it is commonly used in Nigeria as a remedy for arthritis and rheumatism. Curcuminoids is said to be the active ingredient, which acts as neutralizer of free radicals in fighting against many degenerative diseased conditions such as lung diseases. This plant can be synergized with other immune boosting plants like *Psidium guajava*, and *Magnifera indica*. Turmeric is profitably rich in anti-inflammatory properties and has been combined with other household herbs in the management of COVID-19 locally.

***Aframomum danielli* (Alligator pepper)**

The plant A. danielli is commonly called alligator pepper with other names in English like guinea grains and guinea pepper. It possesses both medical and nutritive values and domiciles in the rain forest (Omoboyowa *et al.,* 2017). Interestingly, the grains of paradise have a close resemblance to alligator pepper sharing same shape, appearance and feature. Osuntokun (2020) revealed the differences in the two identical plants (grains of paradise and alligator pepper) despite the close similarities. Alligator pepper serves as both herb and spices derived from varying species: *A. danielli*, *A.* citratum or *A. exscapum* (Osuntokun, 2020). Unlike grains of paradise (*A. melegueta*), which is generally sold only as seeds; alligator pepper is harvested and sold in the whole form or as a pod containing the seeds. *A. danielli* has been used traditionally in the treatment of varying ailment affecting the lungs including pneumonia, wounds, and for prevention and treatment of infections (Bamidele, 2019). The phytochemicals: alkaloids, glycosides, tannins, flavonoids, sterols, triterpenes, oils and resins are largely responsible for the healing potentials (Mohammed *et al.* 2017; Bamidele, 2019). The peppery and pungent taste are said to evolve from aromatic ketones component of the seed (paradol) including essential oils in small quantities (Doherty *et al.,* 2010). We assume that paradol content of the seed, which is responsible for heat production, may have impeding effects against SARS-CoV-2 and other precipitating ill conditions in the respiratory system. Tannins (a phytochemical property) content of the seed is also capable of inhibiting toxins in the system. In combination with other medicinal spices like ginger and garlic, it may assist more in resuscitating a dying respiratory organ and further boost the overall immune function of the body.

Recommendations and Conclusions

In the current battle against COVID-19 pandemic, symptoms of SARS-CoV-2 may be alleviated or resolved with medicinal herbs such as those listed above and in relation to the pathophysiology of the novel virus causing COVID-19: difficulty in breathing, pneumonia and fibrosis.Some of the symptoms such as ache, pains, nasal congestion, runny nose, sore throat, fever, tiredness, dry cough, diarrhea amongst others. A combination of one or two of the above named herbs can serve as supportive treatment for COVID-19 sufferers, which helps to take care of the symptoms and boosting the patient's immunity against the virus itself. Currently there are mixed reactions on the combination of herbs (gallic,

ginger, tumerric, alligator pepper, dongoyaro, lemmon grass and lime juice) for the treatment of COVID-19 and a lot of testimonies in support of the synergy between the prescribed herbs (Unpolished report). In another development, Oburunbebe stick or banga has exciting stories on the usage in time past; accounts for its anti-allergic properties including being used as anti-inflammatory agents in supporting a healthy bronchial health status (Dry and Vincent, 1991). The active substances in the plant are glycyrrhizin and glycyrrhetinic acid, which collectively serve as a powerful inhibitors of cortisol metabolism probably due to its steroid-like structures amongst other reasons. It has also been discovered that the root of this plant has a long standing history of being used for treating cough, flu, respiratory disorder as well as asthma, and chronic pulmonary disease which may also serve as supportive treatment for some of the symptoms. Tulsi has immune-supportive properties, encourages heart health, and enhances respiratory function (Dry and Vincent, 1991), and could be explored to enhance immunity of COVID-19 patients enabling it to better fight against the virus. All in all, there are other helps inventively missing from the list due to lack of supportive materials or scientific backups but have existed of old and are still in use for the healing of majority of lung diseases. Therefore, herbs remain essentials for the continuous existence of human race and particularly at this time where the world has no known or established protocol in the fight against COVID-19. Both local and processed herbs have been providing traditional and modern remedies to the healthcare system. Herbs have been in existence from the days of our forefathers, and are indeed as old as humans may appear to have lived. Many of the aforementioned herbs have been in use for treating respiratory disorders and serving as protection against respiratory damages borne from diseases and infections; may be of great benefit in treating or alleviating the symptoms of the novel COVID-19. We strongly recommend the use of these herbs as supportive treatment plan or palliatives, which will help in boosting patients' immunity against the novel CoV disease pending availability of vaccines and definitive treatment protocols.

Figure 3: *N. sativa* (Black seed Oil); *C. citratus* (Lemmon grass); *A. sativum* (Garlic); *Z. oficinale* (Ginger); *C. domestica* (Turmeric) and *A. danielli* (Alligator pepper).

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