



COVID-19: Primary Cure by Aromatic and Medicinal Plants: A Review

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Abstract

Currently, Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), has rapidly spread across China and around the world, causing an outbreak of acute infectious pneumonia. The supportive care and non-specific treatment to ameliorate the symptoms of the patient are the only options currently with some vaccines are also available. In India some medicinal and aromatic plants are used for such similar type of virus from ancient. Present review includes some plant species used to cure such diseases with literature survey. We suggest traditional Indian medicinal plants as possible novel therapeutic approaches, exclusively targeting SARS-CoV-2 and its pathways.

Keywords: Medicinal Plants; Coronavirus; Pneumonia; COVID-19

Introduction

Coronavirus (SARS-CoV) and Middle East respiratory syndrome Coronavirus (MERS-CoV), emerged in humans and caused fatal respiratory illness, making emerging Coronaviruses a new public health concern in the twenty-first century [1]. First in end of November 2019, there was pneumonia type dieses in Wuhan in China was noted [2]. Latter it was confirmed as a new type of Coronavirus named as SARS-CoV-2 [3]. The World Health Organization (WHO) named the Wuhan pneumonia as Coronavirus disease-2019 (COVID-19) [4]. The COVID-19 patients showed typical respiratory symptom (such as cough, fever, and lung damage) and some other symptoms such as fatigue and diarrhea [5]. Due to the rapid spread of SARS-CoV-2 through human-to-human transmission, the cases currently continue to rise. SARS-CoV-2 extracted from patients with pneumonia [6-10]. This is mainly due to the lack of medicines or vaccines against this virus. Aromatic and medicinal plants remain an alternative to contain and prevent this pandemic in their own way. Those medicinal and aromatic plants, frequently used in traditional medicine, play a very important role, as they contain bioactive compounds which could be used

to develop new formal medicines to relieve patients with symptoms of COVID-19 with no or minimal adverse effects. This review is prepared with the help of following Databases: Google Scholar, Science Direct, Pub Med, Scopus, Web of science, Springer in addition to a standard search using the search engines.

Origin, Nature and Worldwide Spreading

In late December 2019, several health facilities in Wuhan, in Hubei province in China, reported clusters of patients with pneumonia of unknown cause [1,11]. Similarly to patients with SARS and MERS, these patients showed symptoms of viral pneumonia, including fever, cough and chest discomfort, and in severe cases dyspnea and bilateral lung infiltration [2,11,12]. By metagenomics RNA sequencing and virus isolation from bronchoalveolar lavage fluid samples from patients with severe pneumonia, independent teams of Chinese scientists identified that the causative agent of this emerging disease is a beta-coronavirus that had never been seen before [10-12]. On January, the WHO declared the novel Coronavirus outbreak a public health emergency of international concern [13,14]. On 11 February,

the International Committee on Taxonomy of Viruses named the novel Coronavirus 'SARS-CoV-2', and the WHO named the disease 'COVID-19' [15]. In March 2020, the WHO officially characterized the global COVID-19 outbreak as a pandemic [16]. Since March, while COVID-19 in China has become effectively controlled, the case numbers in Europe, the USA and other regions have jumped sharply. According to the COVID-19 dashboard of the Center for System Science and Engineering at Johns Hopkins University, as of 11 August 2020, 216 countries and regions from all six continents had reported more than 20 million cases of COVID-19, and more than 7,33,000 patients had died [17]. Although genetic evidence suggests that SARS-CoV-2 is a natural virus that likely originated in animals, there is no conclusion yet about when and where the virus first entered humans. As some of the first reported cases in Wuhan had no epidemiological link to the sea food market [18].

Clinical Features of COVID-19

The clinical features of COVID-19 are varied, ranging from asymptomatic state to acute respiratory distress syndrome and multi organ dysfunction. The common clinical features include fever (not in all), cough, sore throat, headache, fatigue, headache, myalgia and breathlessness. Conjunctivitis has also been described. Thus, they are indistinguishable from other respiratory infections [7,9,19-22].

Aromatic and Medicinal Plants Used to Primary Cure to COVID-19

The forests of India have been the source of traditional medicines for millennia. Total of the 17,000 species of higher plants described in India, 7500 are known for their medicinal uses [23]. The Charak Samhita, a document on herbal therapy written about 300 BC, reports on the production of 340 herbal drugs and their indigenous uses [24]. The Himalayan range in the northern part of India harbor's a great diversity of medicinal plants. Approximately 8000 species of angiosperms, 44 species of gymnosperms and 600 species of pteridophytes that have been reported in the Indian Himalaya [25], 1748 species are known for their medicinal properties [26]. The state of Uttarakhand is a part of northwestern Himalaya and still maintains a dense vegetation cover (65%). The maximum species of medicinal plants have been reported from Uttarakhand [27,28] followed by Sikkim and North Bengal [29]. The trans-Himalaya in contrast, sustains about 337 species of medicinal plants [30], which are low compared to other areas of the Himalaya due to the distinct geography and ecological marginal ecological conditions [31]. Recent years have seen a sudden rise in the demand for herbal products and plant-based drugs across the world resulting in the heavy exploitation of medicinal plants. Habitat degradation, unsustainable harvesting and

over-exploitation to meet the demands of the most illegal trade in medicinal plants have already led to the extinction of more than 150 plant species in the wild [32]. More than 90% of plant species used in the herbal industries is extracted from the wild, and about 70% of the medicinal plants of Indian Himalaya are subject to destructive harvesting. The majority of these plants stems from sub-alpine and alpine regions of the Himalayas [33].

Eucalyptus

Eucalyptus belongs to the Myrtaceae family which includes 140 genera and about 3800 species distributed in tropical and subtropical regions of the world [34]. Eucalyptus has a very powerful action on the human body; survey revealed antiviral, antibacterial and antifungal activities enabling to fight all viruses, bacteria and fungi [35]. Essential oils from this plant have broncho-dilating property; Eucalyptol (1,8 cineole), main compound from *Eucalyptus* essential oil, can be used as a potential inhibitor of the COVID-19 infection pathway and may represent potential treatment options [36-38].

Cinnamon (*Cinnamomum sp.*)

The genus *Cinnamomum* belonging to the family, Lauraceae comprises of evergreen aromatic trees and shrubs. The leaves and bark are a rich source of aromatic oils. Twenty six species of *Cinnamomum* are found in India, of which 12 are from north east and south India [39]. The bark of various *Cinnamomum* species is one of the most important and popular spice. Additionally it is used for medicinal purpose also. Cinnamon is mainly used in the aroma and essence industries due to its fragrance [40,41]. The essential oil of *Cinnamomum tamala* has great antibacterial, antioxidant, antidiabetic, antimicrobial and many more properties [42]. *Cinnamomum glanduliferum* shows antimicrobial activity and is used as a stimulant and carminative [43,44]. In addition, a recent study has shown the effectiveness of cinnamon with other ingredients (Gene-Eden-VIR) to exert a variety of antiviral effects on beta coronaviruses and SARS-CoV, by inhibiting of cell entry and infection, inhibiting of replication and inhibiting the viral proteases, to improve the antiviral immune response and reduce the formation of virulent quasi-species [45-47].

Ginger

Zanjabeel or Adrak is also known as *Zingiber officinale* Roscoe. Phytochemical analysis of ginger extracts indicated the presence of phenolic compounds, saponin, tannin and flavonoids [48]. Moreover, Gingerols have incredible antibacterial and analgesic properties. Ginger is used for the treatment of fever, pain, nausea, indigestion and vomiting.

It has also been used to treat respiratory diseases, coughs, sore throat, and kidney infections [49]. Similarly, ginger has been shown to be effective against respiratory infections especially its methanol extracts [49]. Concerning the COVID-19 pandemic, a study carried out in this direction showed that eight compounds found in the rhizomes of *Alpinia officinarum* and *Zingiber officinalis* have been identified as potential inhibitors of SARS-CoV-2 PLpro, which means that ginger rhizome extracts can be used against SARS-CoV-2 [50].

Mentha

Mentha is a genus of the Lamiaceae family (Labiatae). This plant family contains a wide spectrum of polyphenolic compounds, which have different well known biological properties [51]. They can also have anti-inflammatory, antiemetic, carminative, diaphoretic, analgesic, antispasmodic, antitussive and stimulant effects [52,53]. Menthol which is a common isolate of this genus has an effective antimicrobial activity [54]. In a recent study, the mint showed incredible results against *Chlamydia pneumoniae* responsible of respiratory infections, pneumopathies and bronchitis [55]. Studied showed that *Mentha* can interfere with amino acids in the enzyme cavity to inhibit the COVID 19 virus protease enzyme [56].

Artemisia

Artemisia is a large genus of the Asteraceae family. With more than 500 species, *Artemisia* is a cosmopolitan, wind pollinated genus, Concerning the COVID-19 pandemic, a study has shown an effective effect of artemisinin and its compounds (artemisinin derivatives) for patients with this virus. To this end, a recommendation for the potential reorientation for the treatment of patients with SARSCoV-2 after successful clinical studies, by the extraction of artemisinin from *Artemesia* is proposed in order to cope with this pandemic [57].

Withania Somnifera

Ashwagandha or Rasayana (Tonic), or *Withania somniferous*, since 6000 BC is one of the very important and precious herbs of Indian Ayurvedic system. Ashwagandha has main chemical constituents of phytochemicals namely withanolides. According to Ayurveda it is reported that *Whithanone* reduces the electrostatic component of binding free energies of ACE2-RBD complex and thus block or weakens the COVID-19 entry and its subsequent infectivity. It is also reported that the host cells namely ACE 2 in the human body got entrapped by SARS-CoV-2 with the help of its spike protein Receptor-Binding Domain (RBD). *Withania somnifera* contains variety of phytoconstituents like Withanolide A & B, Withaferin A, Withanone, Withanosides

[58]. *Withania somnifera* would be an effective agent in the management of COVID-19 through modulation of host Th-1/Th-2 immunity. Withanolide-B, Withanone and Withaferin-A, major phytochemicals of *Withania somnifera* have predicted binding energy lower than the pharmacological inhibitor, N3. The binding of these phytochemicals with main protease may slow down the cleavage of PPs to releases NSPs and decrease the process of viral replication and transcription [59-62].

Curcuma

Turmeric, also known as *Curcuma domestica* is a perennial herb and belongs to the family Zingiberaceae (ginger). The turmeric powder mainly consist of carbohydrates, protein, fat, dietary fiber and minerals, essential oils and curcuminoids. Mainly the rhizome, portion of the turmeric plant is used for medicinal purpose, as a flavor in many cuisines and also as a medicine to treat many diseases with potential anti-inflammatory properties. Turmeric helps in the natural cleansing of the respiratory tract; it also supports in fighting against infection and its anti-inflammatory quality relieves individuals in cases of cold and flu. *Curcuma longa* contain demethoxycurcumin, curcumin, diacetylcurcumin [63], as a major phytoconstituents, which are the most recommended compounds found in medicinal plants that may act as potential inhibitors of COVID-19 Main Protein (Mpro) [64-68].

Ocimum Sanctum

Ocimum sanctum extract can be included as a preventive measure against COVID-19 due to its potential to inhibit replication of Covid-19 supported with its immunomodulatory feature and ACE II blocking properties. *Ocimum sanctum* containing, Tulsinol type of compounds and dihydrodieuginol-B inhibit SARS Coronavirus main protease and papain-like protease [69]. *Ocimum sanctum* is being used in the management of pain, diarrhea, cough and fever, which are the common symptoms of COVID-19 [70]. *Ocimum sanctum* boosts the immunity of the body and helps to defense the threatening virus and bacteria [71]. In Ayurveda, Tulsi is denoted as "Elixir of life" for its healing capability and promising potential in curing different health ailments including bronchitis, pyrexia, rheumatism, asthma, skin diseases, parasitic and microbial infections, gastric and hepatic disorders etc. Regarding the role of *Ocimum sanctum* in controlling COVID-19, Tulsi is already being used for curing pain, diarrhoea, cough and fever, which are common symptoms related to COVID-19 [70-72].

Piper Nigrum L.

Piper nigrum L. is also referred as king of spices due to the extensive use of its dried unripe fruit in almost all

cooking worldwide [73]. With proven antiviral properties, particularly against viruses responsible for infection in the respiratory tract, its key alkaloid components piperine and 10 piperamides can be the potential phytochemicals that can help in the fight against COVID-19 which is also a respiratory tract infection [74,75].

Tinospora Cordifolia

Giloy or *Tinospora cordifolia* is one amongst the most flexible restoring bushes. This is normal herb utilized as a part of Ayurvedic medication. It is one of the best Rasayana considered and is surprising in its strong flexibility. It holds many biologically important phytochemicals including lactones, alkaloids, glycosides, steroids, sesquiterpenoid, diterpenoid, aliphatic compounds, phenolics, polysaccharides and flavonoid which play immunomodulatory activity in human body [76]. It has anti-diabetic [77], antioxidant, anti-inflammatory [78], antiperiodic, antispasmodic, anti-arthritis, anti-allergic [79], antimicrobial, anti-osteoporotic [80], antitoxic, anti-stress, anticancer, anti-HIV, wound healing [81] properties.

Allium Sativum

Lahsun is one of the most important and common of all plants which are marked in the history of mankind. The chemical constituents of garlic majorly consist of sulphur based compounds which are responsible for its peculiar smell and taste which includes diallyl polysulfides, vinyl dithiin, ajoene, S-allyl cysteine, alliin and few non-sulphur compounds like enzymes, saponins, maillard reaction products and flavonoids. Further, it has been reported by many researchers that garlic extract has various remarkable medical effects and powerful anti-inflammatory and antiviral properties which helps on curing various types of diseases like cardiovascular, cancer, common cold, influenza virus [82,83]. Garlic boosts the immune system and helps in fighting against viruses and other diseases. It has Allicin which is board spectrum antibiotics [84].

Conclusion

Presently few vaccines are available in India which is using to cure COVID-19, for enhance immune system of body we find the alternate source as Ayurvedic product and medicinal plant which not only provided healthy environment to body but also boost the immune system without causing any side effect. Since Ayurvedic products cannot completely cure the COVID-19 but it could be minimizing the risk of viral infection and reduces the mortality rate. From long time, we are aware of the beneficial properties of Ayurvedic and medicinal plant product utilizing to cure infectious and other diseases.

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