



## Ayurvedic Remedies of Covid-19

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### ABSTRACT

The Sanskrit term Ayurveda has translated knowledge of life. It is one of the world's oldest healing systems that originated in eastern culture and it includes numerous medical concepts and it's a hypothesis for treatment and prevention of disease. In ancient times near to 3000 years ago in India when there are no synthetic medicines was developed then people used Ayurvedic plants to get cures for different diseases. Ayurveda is based on a belief that health and wellness depend on a delicate balance of mind, body, and spirit. Ayurvedic herbs are key components of Ayurveda. COVID-19 is an infectious disease found in December 2019 and it has now become a pandemic. The COVID-19 infection is produced by virulent severe acute respiratory syndrome-Coronavirus-2 (SARS-CoV-2) virus although various antiviral drugs are available for controlling the infection but sometimes, they lack in supply for treating the worldwide population. So, it has become imperative to develop an effective medical strategy for the management of COVID-19 which has become a major threat to humanity. Herbs exhibit various biological activities so; they can effectively help with managing the pandemic. This review discussed some herbs which have the potential for the treatment of COVID-19.

**Keywords:** Ayurveda, Traditional herbal medicines, Immunity booster, COVID-19.

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### INTRODUCTION

The first human cases of COVID-19 were first reported by officials in Wuhan City, China<sup>1, 2</sup>. It is enveloped non-segmented positive single-stranded RNA viruses. The effect of this pandemic on the economical and psychological level, World Health Organisation is constantly monitoring the mortality rate of the COVID-19 virus, according to its latest report in the last 7 days, there has 3,44,110 confirmed cases of COVID-19 and 8,595 deaths occurred in India<sup>3</sup>. It is because of virus mutation and fast propagation or transmission of the virus.

#### Causes

According to WHO COVID-19 disease is caused by the SARS-CoV-2 virus, which spreads between people in several different ways. Caused by spreading the virus is mainly close contact with an infected person via respiratory droplets by either sneezing or coughing. There are two more pathways of transmitting virus they are contact and aerosol transmission<sup>4</sup>.

#### Symptoms

The COVID-19 infected patients experience some specific symptoms ranging from mild to severe and may appear two to fourteen days after exposure to the virus. These

symptoms are cough, shortness of breath, Fever or chills, fatigue, muscle or body aches, loss of taste or smell, sore throat, runny nose, nausea or vomiting, and diarrhoea<sup>5, 6</sup>.

#### Diagnosis

The direct or conformational detection is done by Reverse Transcriptase Polymerase Chain Reaction RT-PCR which is standard for diagnosis of COVID-19 infection with other technologies like CRISPR-mediated detection. Some conventional detection techniques of COVID-19 are molecular tests, rapid antigen tests, serology tests, and computer tomography. Molecular tests work on the genome of the COVID-19 virus specifically on the viral nucleic acid to increase the concentration of the viral genome by amplification so that it is detectable by the corresponding device. Serology tests detect antigen proteins and antibodies produced in response to antigen. Rapid antigen test detects the active infection but its result might be false as compared to RT-PCR<sup>7-8</sup>.

#### PATHOPHYSIOLOGY

COVID-19 is the disease caused by the SARS-CoV-2 virus. The current Covid-19 is both similar and different to the prior severe acute respiratory syndrome (SARS; 2002-2003) and the Middle East respiratory syndrome (MERS; 2012-ongoing). All 3 viral infections are commonly present with cough and fever, which frequently lead to respiratory tract disease. With poor clinical outcomes associated with older age and underlying health conditions. Confirmation of infection requires nucleic acid testing of respiratory tract samples. Coronaviruses are a large family of single-stranded enveloped RNA viruses. Based on the cells that are likely infected, Covid-19 can be divided into three



phases that correspond to different clinical stages of the disease<sup>9-11</sup>.

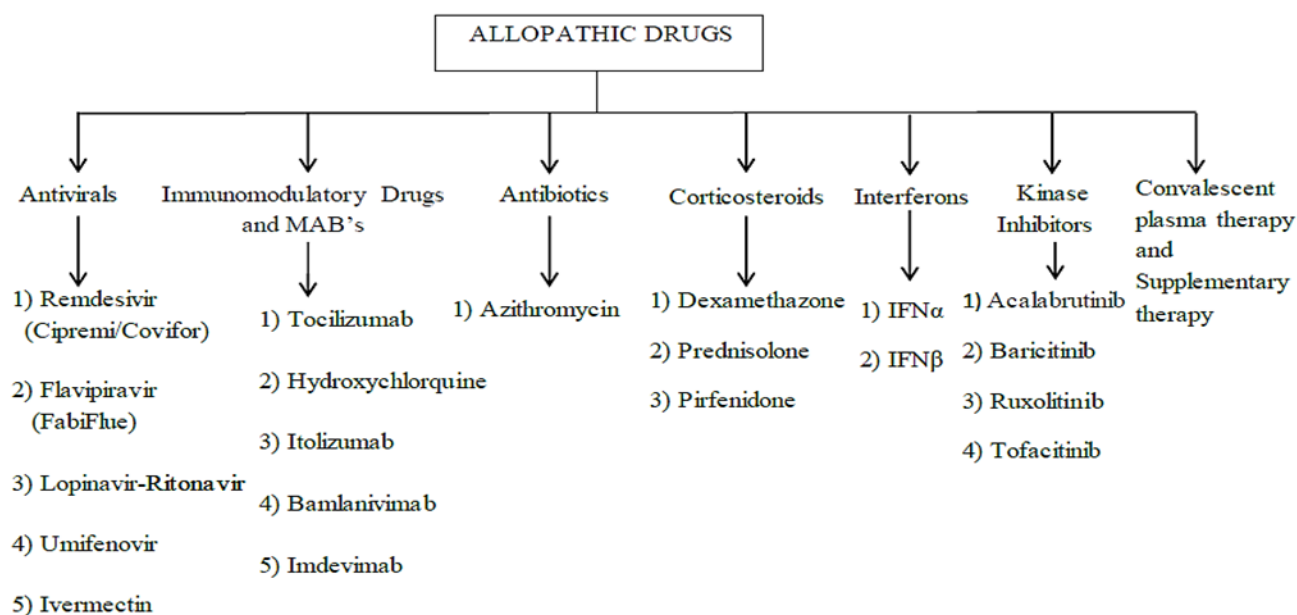
**Stage 1:** Asymptomatic State (initial 1-2 days of infection) the inhaled virus likely binds to epithelial cells in the nasal cavity and starts replication. SARS-CoV-2 uses the SARS-CoV receptor ACE2 for entry and the serine protease TMPRSS2 Ciliated cells are infected in the conducting airways. The virus can be detected at this stage by nasal swabs<sup>12</sup>.

**Stage 2:** Upper airway and conducting airway response (next few days) Virus produces devastating pneumonia with diffuse alveolar damage and increases cytokines and chemokines. Secretory vesicles filled with virus RNA concentrations increased with time, released by exocytosis from the apical surface of a polarized type II cell. Viral infection reduces the secretion of surfactant proteins. At this stage, an infected patient who is already suffering from health issues and aging need to be admitted to the

ICU. It should be monitored under conservative symptomatic therapy<sup>9,10</sup>.

**Stage 3:** Hypoxia, progression to ARDS. 20% of infected patients progress to stage 3 and develop pulmonary infiltrates and very severe disease. The virus reaches the gas exchange unit of the lungs and infects the alveolar type II cells. The cells undergo apoptosis and die. Alveolar type II cells are precursors for type I cells. And a secondary path for epithelial regeneration triggered. SARS-CoV-2 binds to the host cells through ACE2 receptors, which are expressed by epithelial cells of the lungs, intestine, kidney, brain, and blood vessels. The wound healing of alveolar damage leads to scarring and fibrosis. ACE2 inhibitors reduce their diminished immune response and ability to repair the damaged epithelium. The symptoms of SARS-CoV-2 resemble those of the common cold, including fever, coughing, and shortness of breath. These infections may lead to pneumonia, multi-organ failure, severe acute respiratory syndromes, and even death<sup>9,12,13</sup>.

## ALLOPATHIC REMEDIES



## Ayurvedic View

Ayurveda, the term in Sanskrit, originates from two words *ayu* which means life, and *veda* which means science; combining these two terms, the word Ayurveda was come, which means "The Science of Life". Hence, Ayurveda is not only intended for "natural" but also it's a holistic method for physical and mental health. In this covid pandemic, the death rate and people getting infected rate is increasing day by day. This situation is much more severe due to possible devastating situations because of several social and economic factors. To have effective management of this severe situation we need to go back to our Ayurvedic knowledge. This situation has taught us one lesson "old is gold". For effective management, we need to accept and practice yoga and Ayurveda and these can certainly play a pivotal role to augment preventive measures. Ayurveda has

different types of remedies medicines, special diets, meditation, yoga. As your body is natural therefore natural remedies have no side effects on our body<sup>14</sup>.

## Ayurvedic Treatments

The origins of these medicines lie in the foothills of the Himalayas and different parts of India where the sages such as Acharya Charak, Acharya Sushrut, implemented the applications of these herbs in their day to day lives. These medicines include such as Neem, turmeric and ginger, Tulsi, Cinchona, Emblica, etc. These medicines play important role in this pandemic on the body they increase the immunity also reported as used in Respiratory disorders. During dry cough / sore throat- According to the latest survey Steam inhalation with fresh neem, clove, or tulsi leaves can be practiced once in a day with great chances of reducing cough and also get relief blocked nose. To increase



immunity take decoction (Kadha) made from Tulsi (Basil), Dalchini (Cinnamon), Clove, Shunthi (Dry Ginger) - once or twice a day. Ginger rhizome diet for 12 weeks showed increased haemoglobin, haematocrit, WBC MCH, MCHC, values<sup>14</sup>.

## AYURVEDIC HERBS AND MEDICINES FOR COVID-19

### *Azadirachta indica*

*Azadirachta indica* is commonly called 'Indian Lilac' or Neem and in Sanskrit called 'Arista' which means a total and perfect. Neem has been extensively used in Ayurveda, Unani and Homoeopathic medicine and has become a center of attraction of modern medicine for more than 4000 years due to its pharmacological properties<sup>15</sup>. The pharmacological activities of *A.indica* which are reported are antibacterial, antiviral, antifungal, anti-inflammatory, antipyretic, antiarthritic, hypoglycemic and antitumor, etc<sup>16</sup>. The pharmacological activities shown by neem because of its chemical constituents present in it some of them are azadirachtin, nimbolin, nimbin, nimbidin, sodium nimbin, gedunin and quercetin. Leaves of neem contain 6-desacetylnimbinene, Malicinahydrate, nimocinol, isomeldenin, nimbolide and Zafra. According to the latest studies it was found that Malicinahydrate and derived compounds of leaves of neem might possess COVID-19 inhibiting properties. Leaves of neem decrease the blood sugar and inhibit ACE2 receptors which are responsible for penetration of the COVID-19 virus in the host cell<sup>17</sup>. Neem serves as a natural immunomodulator because it contains vitamins like C, E&K. COVID-19 virus covered with Membrane(M) and Envelope(E) proteins which are essential for replication of the virus and In silico docking study found that the Nimbolin A has strongest binding free energy to this M and E proteins Thus, we can say the neem is a source of promising futuristic antiviral drugs<sup>18</sup>.

### *Zingiber officinale*

*Zingiber officinale*, commonly called ginger, belongs to the family of Zingiberaceae. Rhizomes of ginger have medicinal properties and are extensively used for treatments. Ginger is widely used all over the world as Ayurveda, Siddha, Unani, and Chinese herbal medicine. It is mostly used for anticancer, antiviral, antidiabetic, antimicrobial, antioxidant, nephron-protective, sedative, hepato-protective, anti-inflammatory, analgesic, antiemetic and antitumorogenic treatments<sup>19,20</sup>. The characteristic odour and flavour of ginger is because of the chemical constituent gingerone and shogaol<sup>21</sup>. Some active constituents of ginger are 6-gingerol, zingiberene, zingerone, gingerone etc. Ginger has been proven that it has effective action on various viruses<sup>22</sup>. Ginger is one of the most effective natural immunomodulators the 6-gingerol present in ginger has been proved that it has the highest binding affinity to spike proteins and RNA binding protein targets of COVID-19 and has good antiviral action against it, so it can become a promising drug to treat COVID-19. It also found that the gingerone, zingiberene, and other phytochemicals of ginger have a good binding affinity to ACE receptors and

spike proteins of COVID-19. Ginger is a natural immunomodulator that can enhance immunity and provide great defense against the COVID-19 virus. The Ministry of Ayush has recommended the *Zingiber officinale* as the main ingredient of their herbal formulations because of its wide medicinal activities<sup>23, 24</sup>. So, *Zingiber officinale* can be a great preventive measure for COVID-19.

### *Cinchona*

Cinnamon is one of the foremost important herbal drugs and has been widely employed in Asia for quite 4000 years. Cinchona is also called Peruvian bark and it is found in South America and India. In India, it is mostly found in hilly regions. Cinchona belongs to the family of Rubiaceae. More than 20 alkaloids are found in the bark of cinchona in which the most important alkaloids are quinine, quinidine, cinchonine, and cinchonidine. Along with that it also contains triterpenes, essential oils, phytosterols, flavonoids, etc. Terpenoid indole alkaloids are mostly found in cinchona. Quinine alkaloid is derived from the 'fever tree' conventionally used to treat malaria. Covid patients suffer from inflammation of the lungs; cinchona can help them by reducing inflammation because of its anti-inflammatory property. Besides, it has antimicrobial, antioxidant, antiparasitic properties. Quinine is the most important constituent of Hydroxychloroquine drug which is used for the treatment of malaria and nowadays it is used to treat the COVID-19 infections by glycosylation ACE 2 spike proteins and blocks the entry of COVID-19 virus. It is also a natural immunomodulator that boosts immunity and provides defence against COVID-19. It is found that the quinine sulphate drug synthesis from cinchona has antiviral action against COVID-19 by enhancing the synthesis of RIG-I and IFN-alpha synthesis which stops viral mRNA synthesis of COVID-19. Some analogues of quinine are currently being tested against the COVID-19 virus<sup>25-27</sup>.

### *Curcumin longa*

Curcumin is a traditionally used medicinal plant in India found in rhizomes of the turmeric plant, *Curcumin longa*<sup>28</sup>. Curcumin belongs to the family Zingiberaceae and it is an active constituent of turmeric, is known for its various medicinal activities, because of its active constituents which are flavonoids and some volatile oils, includes atlantone, turmerone, and zingerone Turmeric is a powerful antioxidant so, it can use for prevention of cancer and also it is powerful anti-inflammatory agent which reduces inflammation by producing histamine. Along with it have pharmacological activities like antidiabetic and related disorders, anti-angiogenic, antioxidant, antibacterial, antiviral, etc. Recently studied that COVID-19 virus takes entry into the host by Angiotensin-Converting Enzyme2 (ACE2) membrane receptors present on the mucous membrane. The binding of S protein of virus and ACE2 receptors takes place to take entry into host cell it is found that Curcumin acts as receptor-binding domain (RBD) site of viral S protein and also viral attachment site of ACE2 receptors. So, curcumin has become a potential inhibitory agent that blocks the interaction of virus and host cells.



Natural products of curcumin with vitamin C with zinc supplements that boost immunity and provide defence against COVID-19 infection<sup>29</sup>.

### ***Ocimum sanctum***

*Ocimum sanctum* is commonly called Tulsi. It belongs to the family of Lamiaceae. Tulsi contains monoterpenes such as camphor, cinole, estragole, eugenol. Plant leaves contain vitamin A and C. Ursolic acid of Tulsi inhibits proliferation and induces apoptosis and the accumulation of cells in the G1, G0 phase of the cell cycle. Tulsi leaves aqueous extract used for the treatment of poisoning, stomachache, common cold, headaches, malaria, inflammations, and heart diseases<sup>30</sup>. Oils extracted from the leaves and inflorescence of Tulsi have properties as expectorants, analgesics, antiemetics, and antipyretics; stress reducers and inflammation relievers and as anti-asthmatic, hypoglycemic, hepatoprotective, hypotensive, hypolipidemic, and immunomodulatory agents. Alcoholic extract of leaves shows immunomodulatory effects such as modulation of cytokine secretion, histamine release, class switching, immunoglobulin secretion, and protection against genotoxins<sup>31</sup>. Chewing of herbal leaves stimulates salivation, which increases the salivary bicarbonate concentration, thus increasing the salivary pH. Tulsi tea is effective in the treatment of chronic bronchitis and asthma and relieves stress, restores and improves body immunity and digestion. Tulsi is mostly used in fever, sore throat, headache, cold, flu, chest congestion. The compounds like ursolic acid, carnosol, rosmarinic acid, cirsilinole, apigenin, eugenol, present in *Ocimum sanctum* increase haemoglobin concentration, decrease cyclooxygenase (CoX)-2 and lipoxygenase (LOX)-5 enzymes activity, suppress NF- $\kappa$ B classical pathway, up-regulation of IL-2, IFN- $\gamma$ , and TNF- $\alpha$ , downregulation of IL-1 $\beta$  and produce of SRBC antigen-specific antibodies, which represent a significant defense mechanism to assess T-cell-dependent antibody responses capacity also is an immunomodulator and regulator as it enhances immune-boosting response by increasing T-helper and NK cells; phagocytic activity and with the increase in lymphocyte count, neutrophil count and antibody production. During tulsi plays a vital role as an immunity booster to beat covid 19. Fixed oil has antipyretic activity by inhibition of prostaglandin. Tulsi has an antihypoxic effect and it increases the survival time during anoxic stress<sup>32</sup>.

### ***Tinospora cordifolia***

*Tinospora cordifolia* (family Menispermaceae) is a climbing deciduous shrub and herb vine. It is also called gurcha or giloy in Hindi. It is a well-known traditional medicine found in India, China, Bangladesh, and Myanmar & Sri Lanka. There are various constituents extracted from *T. Cordifolia* and they belong to different classes like alkaloids, aliphatic compounds, lactones, glycosides, steroids, diterpenoid sesquiterpenoid, phenolic, and polysaccharides<sup>33</sup>. It depicts different medicinal properties, from different parts of the plant like anti-diabetic, anti-cancer activity, Immunomodulatory Activity, Anti-Oxidant Activity, Anti-

Microbial Activity, Anti-Toxic. *T. cordifolia* is the best remedy for children suffering from upper respiratory tract infections. Their fore daily use of giloy in this pandemic can strengthen the respiratory tract. The immunomodulatory property of *Tinospora cordifolia* is well documented. Active compounds 11-hydroxymustakone, N-methyl-2-pyrrolidone, and cytotoxic effects<sup>33-35</sup>.

### ***Cocos nucifera***

*Cocos nucifera* (genus *Cocos* and family *Arecaceae*) is called the "tree of life" or "Kalpavriksha". It is also called nariyal (Hindi) and naral (Marathi). It is cultivated in India, Sri Lanka, Thailand, and Malaysia. *C. Nucifera* has various constituents which have some biological effects like Antioxidant, antimicrobial, vasorelaxant, antihypertensive. Due to the variety of activities of *cocos nucifera*, it is useful in a versatile way<sup>36-39</sup>. Virgin coconut oil is naturally withdrawn from coconut and rich in chain triglycerides, with lauric acid as the predominant fatty acid. In vitro studies show that lauric acid or its derivative exerts repressive activities on COVID-19. SARS-CoV-2 is an enveloped virus with a characteristic lipid membrane having S-glycoproteins (spike proteins) on its surface. S-proteins effectively bind on angiotensin converter enzyme 2(hACE2) human receptor; any disruption of viral membrane lipids could be detrimental to the viral infection process. After which it could thus prevent the entry of the virus into human cells. Therefore, lauric acid-based novel prophylactic would be a useful nasal spray to block respiratory infections such as COVID-19<sup>40</sup>.

### **Ashwagandha**

Ashwagandha is an adaptogenic botanical grown in India which is known for its ability to balance, energize, rejuvenate, revitalize and is a well-known herbal tonic that is also used for cardiovascular diseases. In the decrease in immunity power, stress is the major factor and for increasing the same, strengthening of the defense reactions by nutrition is the most preferred solution. Stress-induced increase of corticosterone production was blocked by feeding with Ashwagandha extract and even more by WB365. Regular usage of the ashwagandha churna is reported to purify the body and increase the life force. It enhances the function of the brain and nervous system and improves memory<sup>41,42</sup>. Various Studies concluded that it also possesses the properties of antioxidant, anxiolytic, performance enhancer, memory boosting, antiparkinsonian, antidote, anti-inflammatory, anti-stress, immunomodulation, tranquilizers type sedative activity, hypoglycemic and proved to be an effective remedy in cancer cells and the malignant growth of different organs too<sup>43</sup>. Also, it is very much recommended that consuming Ashwagandha with cows' milk had the following effects on the human immune system: Through a survey, it is seen that increased inflammatory responses occur in the covid positive patients<sup>44</sup>.



### **Syzygium aromaticum**

Commonly called clove (Family Myrtaceae) it is the most important Traditional Herb. From 2,000 years it is used in India and China, to cure many health's related problems and treat such diverse infections as malaria, cholera, and tuberculosis. Cloves as having antimicrobial, antioxidant, anti-inflammatory, analgesic, anticancer, and anaesthetic, antiseptic, antibacterial, antifungal, and antiviral properties<sup>45-47</sup>. Chemical analysis shows that cloves have different ingredients, the most important being an essential oil called eugenol that acts in analgesic and antioxidant. Cloves also contain a variety of flavonoids which contribute to clove's anti-inflammatory (and antioxidant) properties<sup>48</sup>. Besides, its anti-inflammatory properties and has been shown to guard the lungs against lipopolysaccharide- (LPS) induced acute injury. Treatment with eugenol was also found to inhibit the recruitment of leukocytes into the lung and downregulated the expression of pro-inflammatory cytokines (IL-6 and TNF- $\alpha$ )<sup>49</sup>. It exhibits broad antimicrobial activities against Gram-positive, Gram-negative, and acid-fast bacteria. Cloves can also help to relieve the pain of muscle cramps and some nerve conditions. Clove is used for expectorant which removes sputum from the respiratory tract. In Pandemic daily use of Clove may play a therapeutic role in General Stress Reliever: Clove oil stimulates the circulatory system, clearing the mind and reducing mental exhaustion and fatigue. Coronavirus affected a major part Human body, loose immunity. Clove is General Immune System Booster Clove powder mixed with natural sugar/honey can be taken 2-3 times a day it reduces cough or throat irritation by using clove we can improve our immunity<sup>47,50</sup>.

### **Wood Apple**

*Limonia acidissima* is a moderate-sized deciduous tree grown throughout India. All the parts of *Limonia acidissima* are prescribed in the indigenous system of medicine for the treatment of various disorders, stimulant, cardiotoxic astringent, aphrodisiac, diuretic, tonic to liver and lungs, cures cough, hiccup and good for asthma<sup>51</sup>. Wood apple pulp contains carbohydrates and proteins, beta carotene, vitamin B, vitamin C, thiamine, and riboflavin which will be helpful for immunity-boosting in the pandemic. Coronavirus is mainly affected on respiratory System. *Limonia acidissima* has been reported to produce Antibacterial activity, Antioxidant activity, and Anti-inflammatory activity<sup>52</sup>. In a few studies, the use of anti-inflammatory drugs showed a reduction in symptoms COVID-19. This anti-inflammatory property of *Limonia acidissima* will likely help in the treatment COVID-19

### **Dietary and Lifestyle Changes:**

Intake a freshly prepared cooked hot food with proper nutrition food by assuming the individual's digestive power. Eat freshly prepared Laghu-supachyaahra which is easily digestible. Intake warm water daily and boil it with medicinal herbs like shunthi, Dalchini, etc. Trikatu keeps the body hydrated. Avoid spicy, chilled, cold, heavy foods.

Especially restrict sweet and refrigerated products. Few yoga poses can boost immunity<sup>53, 54</sup>.

**Table 1:** Yoga poses that can boost the immunity

Sr.No	Yoga poses that can boost the immunity
1	Shalabhasana also termed as Locust Pose
2	Anjaneyasana also known as Low lunge pose
3	Bakasana (Crow Pose).
4	Tadasana is commonly known as Mountain Pose.
5	On the other side, exercises include walking, cycling, yoga, swimming, or other low-impact workouts.

### **Effects of Herbal Medicines on the Body:**

Ayurveda is based on 3 basic principles. These principles in Sanskrit are known as doshas they include vatta, pitta, and kapha. Herbal medicines are now in great demand in the developing world for primary health care not because they are inexpensive but also for better cultural acceptability, better compatibility with the human body, and minimal side effects.

### **Side Effects:**

The unguided consumption of Ayurvedic herbal preparations may lead to serious, toxic health issues on the body. A thorough awareness of these plants' actions is needed for their safe selection and consumption. However, unlike drugs, herbal products are not regulated for purity and potency. Herbal drugs are considered food integrators and readily available in the market without prescription<sup>55</sup>.

### **CONCLUSION**

In India, the Ayurvedic system has described a large number of such herbal medicines to provide a better understanding of their active principles and mode of action. It is evident from the products shown above and they are working as Ayurveda carries importance in today's medicinal research. There are so many herbal medicines are currently under research that may be used internally as pills, syrups, and infusions, or externally as plasters and liniments. This will make medicine much safer, affordable, and more accessible. In a pandemic, by using synthetic medication it leads to the toxic effect on the body .so as to overcome side effect we are looking for an herbal formulation which can overcome the adverse effect of synthetic drugs. Hence this review is an initiation to provide a wide option of herbal sources for the treatment of COVID 19.



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