



**RECENT UPDATE ON CORONA VIRUS (COVID-19) AND THEIR HERBAL
TREATMENT**

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ABSTRACT

The corona virus disease pandemic of 2019 is caused by the severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) or (COVID-19). Traditional healers have recommended herbal remedies and dietary herbs for a variety of ailments for thousands of years. As a result, the goal of this study is to provide the most common herbal products, their sources, features, and potential antiviral effects in relation to COVID-19. Until March 2022, publications on herbal products with antiviral properties were searched using English key phrases in a variety of databases, including Web of Science, Google Scholar, Medline, Scopus, and PubMed, NCBI. According to several researches, there are a plethora of essential medicinal plants with antiviral activity that may be used to treat viral infections or as a supportive treatment. Some of the limitations of medicinal plants include a lack of knowledge on the safety profile and dosage for various ailments. By decreasing SARS-CoV-2 multiplication and entrance into host cells, herbal medication can interfere with COVID-19 pathogenesis. Citrus Spp., orange (*C. Sinensis*), *Allium sativum*, *Allium cepa*, *Mentha piperita*, and *nigella sativa* are some of the most desired antiviral medicinal plant species that can provide useful adjuvant components in COVID-19 treatment.

KEYWORDS: Herbal Medicine, Covid19, Corona Virus, Treatment of covid-19, Herbal Remedies, SARS-CoV-2, SARS-CoV-2 Treatment, Immunity Booster.

INTRODUCTION

Corona virus disease 2019 (COVID-19) is a contagious illness caused by the corona virus 2, which causes severe acute respiratory syndrome (SARS-CoV-2). In December of this year, the first known case was discovered in Wuhan, China.^[1] Since then, the disease has spread worldwide, resulting in a pandemic.^[2]

Fever, cough, headache, weariness, breathing difficulty, loss of smell, and loss of taste are common symptoms of COVID 19.^[3] Symptoms might appear anywhere from one to fourteen days after being exposed to the virus. At least one-third of those who are afflicted do not show any signs or symptoms.^[4]

Corona virus

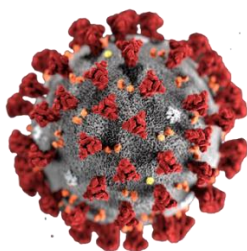


Figure 1.

The majority (81%) of those who acquire symptoms obvious enough to be classified as patients have mild to moderate symptoms (up to mild pneumonia), whereas 14% have severe symptoms (dyspnea, hypoxia, or more than 50% lung involvement on imaging), and 5% have critical symptoms (respiratory failure, shock, or multiorgan dysfunction).^[5,6]

Severe symptoms are more likely to emerge in the elderly. Some persons continue to have a variety of symptoms (long COVID) months after recovery, and organ damage has been reported.^[7] Long-term research are being conducted to learn more about the disease's long-term impact.^[7]

COVID 19 is spread through the air when droplets and tiny airborne particles harbouring the virus are inhaled. Breathing them in is most dangerous when individuals are close together, but they may also be breathed across greater distances, especially indoors. Transmission can also occur if infected fluids are splashed or sprayed in the eyes, nose, or mouth, as well as via contaminated surfaces. People can be infectious for up to 20 days after contracting the virus, and they can spread it even if they don't show any symptoms.^[8,9]

To diagnose the condition, several diagnostic procedures have been established. The nucleic acid of the virus is detected using real-time reverse transcription polymerase chain reaction (rRT-PCR), transcription-mediated amplification (TMA), or reverse transcription loop-mediated isothermal amplification (RT-LAMP) from a nasopharyngeal swab as the standard diagnostic approach.

Sign and Symptoms:-

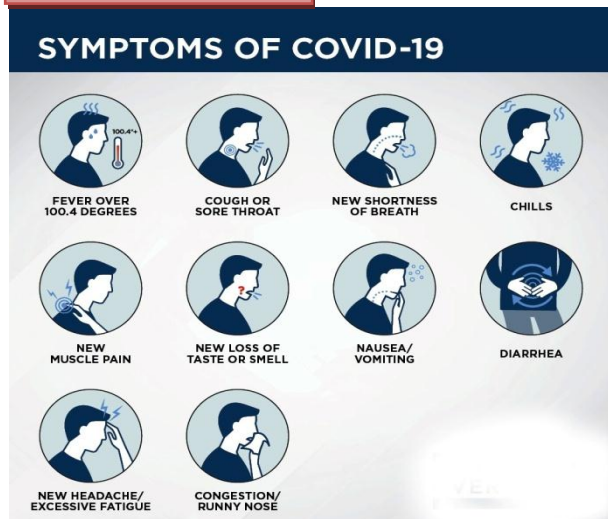


Figure 2.

Several COVID-19 vaccines have been authorised and supplied in a number of countries, with widespread immunisation efforts underway. Physical or social separation, quarantining, ventilation of interior areas, covering coughs and sneezes, hand washing, and keeping unwashed hands away from the face are some other preventative strategies. In public places, the use of face masks or covers has been advocated to reduce the risk of transmission. While medications to suppress the virus are being developed, the primary therapy is symptomatic. Treatment of symptoms, supportive care, seclusion, and experimental approaches are all part of the management process.

Sign and Symptoms

COVID-19 symptoms vary, ranging from moderate symptoms to severe sickness.^{[10],[11]} Headache, loss of smell (anosmia) and taste (ageusia), nasal congestion and runny nose, cough, muscular discomfort, sore throat, fever, diarrhoea, and breathing difficulties are some of the most common symptoms.^[12]

People with the same virus may experience a variety of symptoms, which may vary over time. Three distinct symptom clusters have been identified: Cough, sputum, shortness of breath, and fever are among the respiratory symptoms; muscle and joint pain, headache, and exhaustion are among the musculoskeletal symptoms; and stomach discomfort, vomiting, and diarrhoea are among the digestive symptoms.^[12]

COVID-19 is linked to loss of taste and smell in persons who have never had ear, nose, or throat problems, and it has been documented in as many as 88 percent of instances.^[13]

Among those who develop symptoms, 81 percent have mild to moderate symptoms (up to mild pneumonia), 14% have severe symptoms (dyspnea, hypoxia, or more than 50% lung involvement on imaging), and 5% have critical symptoms (respiratory failure, shock, or multiorgan dysfunction).^[14]

At least a third of those who are infected with the virus never show any signs or symptoms. These asymptomatic carriers are less likely to get tested and hence transmit the illness.^{[15],[16],[17]} Others who are infected will develop symptoms later, referred to as "pre-symptomatic," or have very minor symptoms, and can spread the virus.

There is a lag between when a person becomes sick and when the first symptoms occur, as is usual with infections. COVID-19 has a four to five day median delay. Symptoms appear in the majority of sick persons two to seven days after exposure, and virtually everyone has at least one symptom by 12 days.^[18]

The majority of patients recover from the disease's acute phase. However, some persons – over half of a cohort of home-isolated young adults have a range of consequences, including as weariness, for months after recovery, a condition known as chronic COVID; long-term organ damage has also been documented. Long-term research are being conducted to learn more about the disease's long-term impact.^{[19],[20]}

Causes

Coronavirus illness is caused by infection with the severe acute respiratory syndrome coronavirus 2, or SARS-CoV-2 (COVID-19).

COVID-19 is easily distributed by the virus that causes it. The COVID-19 virus appears to travel mostly from person to person among people in close proximity, according to data (within about 6 feet, or 2 meters). When a person with the virus coughs, sneezes, breathes, sings, or talks, respiratory droplets are discharged. These droplets can be inhaled or land in someone's mouth, nose, or eyes.

When a person is exposed to very small droplets or aerosols that persist in the air for several minutes or hours, the COVID-19 virus can spread. This is known as airborne transmission.

If you contact a virus-infected surface and then touch your mouth, nose, or eyes, the virus can spread. However, the danger is minimal.

The COVID-19 virus can be disseminated by someone who is infected but does not show any symptoms.

Asymptomatic transmission is the term for this type of transmission. The COVID-19 virus can also be disseminated by someone who has been infected but has not yet displayed symptoms. Presymptomatic transmission is the term for this COVID-19 can be obtained twice or more, although this is unusual.

A variation of the original virus is one that has one or more additional mutations. Currently, the CDC has classified two COVID-19-causing viral variants as variations of concern. The delta (B.1.617.2) and omicron (B.1.1.529) variants are two of them. The delta form is more infectious than previous versions, and it has the potential to cause more serious illness. Other varieties, such as delta, may spread more easily than the omicron version. However, it is unclear if omicron promotes more severe illness.^[21]

Risk factors

- Being in close proximity to someone who has COVID-19 (within 6 feet, or 2 meters).
- Being coughed or sneezed on by someone who is infected

Complications

Despite the fact that most persons with COVID-19 have mild to moderate symptoms, the condition can lead to serious medical consequences and death in certain cases. COVID-19 puts older persons and people with pre-existing medical issues at a higher risk of becoming extremely sick.

Complications can include

- Pneumonia and breathing issues
- Organ failure in numerous organs
- Heart problems
- A serious lung ailment that causes a lack of oxygen to reach your organs through your bloodstream (acute respiratory distress syndrome)
- Blood clots
- Acute kidney injury
- Additional viral and bacterial infections^[22]

Types of Corona Virus

While adapting to their new human hosts, SARS-CoV-2, like other RNA viruses, is susceptible to genetic evolution with the formation of mutations over time, resulting in mutant variations with different features than their ancestral strains. Several SARS-CoV-2 variations have been identified during the epidemic, however only a handful are classified variants of concern (VOCs) by the

WHO due to their worldwide public health effect. According to a recent WHO epidemiological bulletin, five SARS-CoV-2 VOCs have been discovered since the pandemic began on December 11, 2021.^[23]

- **Alpha (B.1.1.7):** first variant of concern described in the United Kingdom (UK) in late December 2020
- **Beta (B.1.351):** first reported in South Africa in December 2020
- **Gamma(P.1):** first reported in Brazil in early January 2021
- **Delta (B.1.617.2):** first reported in India in December 2020
- **Omicron (B.1.1.529):** first reported in South Africa in November 2021

Etiology

The virus shares 88% sequence similarity with two bat-derived severe acute respiratory syndrome (SARS)-like coronaviruses, but is farther distant from the severe acute respiratory syndrome coronavirus (SARS-CoV).^[24] As a result, it was given the name 2019-novel coronavirus (SARS-CoV-2). Coronavirus is a single-stranded, encapsulated ribonucleic acid with 9–12 nm-long surface spikes that resemble the solar corona.^{[26],[25]}

The spike (S) protein, which binds to the angiotensin-converting enzyme 2 (ACE2) receptor and promotes subsequent fusion between the envelope and host cell membranes to aid viral entry into the host cell, is one of four primary structural proteins encoded by the coronavirus genome on the envelope.^{[27],[28]}

Based on phylogeny, taxonomy, and established practise, the Coronavirus Study Group (CSG) of the International Committee on Taxonomy of Viruses eventually identified it as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) on February 11, 2020.^[28]

Soon after, the condition caused by this coronavirus was given the designation Coronavirus Disease 2019 (COVID-19) by the World Health Organization. According to current evidence, bats may have been the first hosts of COVID-19, which may have been transferred to people via pangolin or other wild animals sold at the Huanan seafood market, and then spread via human-to-human transmission.^[29]

Pandemic of COVID-19 throughout the World

As of October 28, 2020, 44,322,504 confirmed cases and 1,173,189 deaths have been reported in 217 nations and territories throughout the world.^[30]

Updated COVID-19 cases as of 28 October 2020

Regions	Total Cases	Total Deaths	Total Recovered	Total Active Cases
Asia	13,328,711	237,480	11,789,290	1,292,941
Europe	8,921,074	255,942	3,571,142	5,093,990
North America	10,822,292	346,631	7,204,179	3,271,482
South America	9,465,599	290,300	8,451,570	723,729
Africa	1,747,522	41,854	1,429,087	276,581
Oceania	36,585	967	31,776	3842

Prevention



Figure 3.

PREVENTION

Some COVID-19 vaccines have been issued emergency use authorisation by the US Food and Drug Administration (FDA). The Pfizer-BioNTech COVID-19 vaccine, now known as Comirnaty, has been authorized by the FDA to prevent COVID-19 in persons aged 16 and up. Pfizer-BioNTech COVID-19 vaccinations for ages 5 to 15 have been issued emergency use authorisation by the FDA. The Moderna vaccine, now known as Spikevax, has been authorised by the FDA to prevent COVID-19 in persons aged 18 and up.

On January 16, 2021, India began administering COVID-19 vaccinations. India had delivered about 1.8 billion doses of presently authorized vaccinations as of March 25, 2022, including first, second, and precautionary (booster) doses.^[31,32] In India, 90% of the eligible population (12+) has had at least one vaccination, and 76% of the eligible population (12+) has been completely immunised.^[33]

India first licenced the Oxford–AstraZeneca vaccine (marketed as Covishield by Serum Institute of India) and Covaxin by Oxford–AstraZeneca (a vaccine developed locally by Bharat Biotech). Sputnik V (manufactured under licence by Dr. Reddy's Laboratories, with additional production from Serum Institute of India beginning in September^[34]), Moderna vaccines, Johnson & Johnson vaccine, and ZyCoV-D (a vaccine locally developed by Zydus Cadila) and other vaccine candidates undergoing local clinical trials have since joined them.

A vaccination can help you avoid contracting the COVID-19 virus or keep you from becoming extremely ill if you do contract it. Furthermore, getting vaccinated against COVID-19 may provide better protection than getting sick with COVID-19. According to a recent

study, unvaccinated persons who have previously been infected with COVID-19 are more than twice as likely to become infected with COVID-19 as fully vaccinated people.

Following vaccination, you will be able to resume numerous activities that you may have been unable to do because to the epidemic. The CDC recommends wearing a mask indoors in public if you live in a region with a high proportion of persons with COVID-19 in hospitals and new COVID-19 cases. Two weeks after receiving a second dose of an mRNA COVID-19 vaccine or two weeks after receiving a single dose of the Janssen/Johnson & Johnson COVID-19 vaccine, you are considered completely immunised. If you have had all necessary COVID-19 vaccinations, including booster doses, when you become eligible, you are considered up to date with your immunizations.

For patients who have been vaccinated but do not have a robust adequate immunological response, an extra main dose of COVID-19 vaccine is suggested.

A booster dosage, on the other hand, is advised for persons who have already been vaccinated but whose immune response has diminished over time. According to research, obtaining a booster dosage of COVID-19 can reduce your risk of infection and serious sickness.

People with a moderately or severely compromised immune system should have a second main vaccine plus a booster vaccine.

There are many methods you may take to lower your risk of becoming infected with the COVID-19 virus and transferring it to others.

The World Health Organization and the Centers for Disease Control and Prevention urge that you take the following precautions

- Vaccinate yourself. COVID-19 vaccinations lower the chances of contracting and transmitting the virus.
- Avoid being in close proximity to someone who is sick or has symptoms (within 6 feet, or 2 meters).
- If you're not completely vaccinated, keep a safe distance between yourself and others (approximately 6 feet, or 2 meters) when you're in an indoor public location. If you have a higher risk of serious disease, this is very crucial. Keep in mind that even if they don't have symptoms or are unaware that they have COVID-19, some people can transfer it to others.
- Stay away from crowded areas and places with poor air circulation (ventilation).
- Wash your hands often with soap and water for at least 20 seconds, or use a hand sanitizer containing at least 60% alcohol.
- If you're in an area with a large number of patients with COVID-19 in the hospital or new COVID-19 cases, whether or not you've been vaccinated, wear a face mask in indoor public areas. The CDC

recommends that you use the most protective mask you can find that fits well and is comfortable on a regular basis.

- When you cough or sneeze, cover your mouth and nose with your elbow or a tissue. Discard the used tissue. Hands should be washed as soon as possible.
- Keep your hands away from your eyes, nose, and mouth.
- If you're sick, don't share dishes, glasses, towels, blankets, or other household goods.
- Keep high-touch surfaces, such as doorknobs, light switches, electronics, and countertops, clean and disinfected on a regular basis.
- If you're unwell, stay away from work, school, and public places, and isolate yourself at home unless you're going to see a doctor. If you're unwell, stay away from public transit, taxis, and ride-hailing services.

Treatment of severe infection of COVID-19

If the infection cannot be effectively treated early in the course of COVID-19 therapy, respiratory failure, multiple organ failure, and mortality may worsen, then a serious infection should be considered.

High-grade fever, dry cough, trouble breathing, sweating, chest tightness, weariness, nausea, bloating, red or dark red tongue, yellow coating, and oily skin are the prominent symptoms of these infected individuals. *G. glabra*, *Thymus vulgaris*, *Allium sativum*, *Althea officinalis*, and ginseng may become beneficial in the prevention and supportive management of COVID-19 by tempering the immune system.^[35]



Figure 4.

Some herbal medicine used in COVID-19

Single plant species offer a lot of therapeutic potential in herbal medicine research. It is now well accepted that a single plant may have several functions. Contain a diverse spectrum of biochemical's, posing a challenge to the study of plant pharmacology.^[36] Antiviral, anti-inflammatory, immunomodulatory, and mixed-effects drugs are the most common types. a variety of purposes depending on useful proof of efficacy.

Inflammatory indicators such as interleukin (IL)-6, erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP) have been linked to severe disease and worse outcomes, most likely due to cytokine storm.^[37]

Herbal drugs with reported anti-inflammatory activities may play a significant role in COVID-19 treatment.



Figure 5.

Table 2: Summarizes Several Herbal Medicine Examples Utilized In the treatment of COVID-19.^[38]

Scientific Name	Family	Chemical Constituent	MOA
Malva sylvestris L.	Malvaceae	Polysaccharides	Tetrastigma hemsleyanum Diels & Gilg/Vitaceae Emollient/potent antitussive activity
Aloe barbadensis Mill	Asphodelaceae	HF1Z (polysaccharide)	Emollient/potent antitussive activity
Salvia officinalis L.	Lamiaceae	Polysaccharide	Emollient/potent antitussive activity

Erigeron abajoensis Cronquist	Compositae	Flavone (Scutellari	ACE inhibition
Hibiscus sabdariffa L	Malvaceae	Anthocyanins	ACE inhibition/decrease serum angiotensin converting enzyme, decrease plasma aldosterone
Citrus Spp.	Rutaceae	Hesperetin, hesperidin Rhoifolin, Neohesperidin	SARS-3CLpro inhibition in dose- dependent manner
Glycyrrhiza glabra L.	Leguminosae	Arabinogalactan protein	Spasmolytic activity, protective effects on mucous. # citric acid-induced cough Guinea pigs
Cynara scolymus L	Compositae	Cynaroside	ACE inhibition/IC50 = 49.7%
Paulownia tomentosa Steud.	Paulowniaceae	Geranylated flavonoids	PLpro inhibition/IC50 = 5.0–14.4 μ M
Isatis indigotica	Brassicaceae	Phenol (indigo, sinigrin, aloe emodin, hesperetin, Sinigrin), 2,2- Di (3- indolyl)- 3-indolone, Phaitanthrin D	SARS-3CLpro inhibition/IC50 = 53.8 \pm 4.2 μ g/mL

3.1 Azadirachta indica (neem)

Fever is the most common clinical sign of COVID-19, and these herbs can help alleviate it. The leaves of neem are traditionally cooked and consumed to treat fevers caused by COVID-19, and have been shown to have anti-inflammatory properties in animal experiments.^[39] The animal investigation and in-silico docking studies both demonstrated that neem leaf extracts and its metabolic components like flavonoids and polysaccharides had direct antiviral activity against many viruses, including the Hepatitis C Virus.^[40] Molecular docking studies have shown that neem-derived chemicals including nimbolin, nimocin, and cycloartenol may bind to the SARS-CoV-2 envelope (E), membrane (M), glycoproteins, and have an inhibitory effect in SARS-CoV-2.^[41] Its leaves contain immunoregulatory properties that increase immune response in animal studies.^[42] In mice immunised with the Brucella Rev-1 vaccine, subcutaneous administration of neem seed extract increased post-vaccination IFN- production.^[43] Animal study has demonstrated that neem seed extracts have abortifacient effects in pregnant people.^[44] While clinical investigations have shown that it inhibits the production of human chorionic gonadotropin.^[45] According to studies, the traditional use of neem for therapeutic reasons is based mostly on the ingestion of the leaves, which are cooked in water and then consumed.^[46] One of the key issues is safety; thus, before further research on effectiveness, a clinical study should be conducted to identify safe dosages of neem leaves unique to the formulation intended for usage. Despite the fact that neem leaves have been used for centuries, nothing is known about their toxicity. Users of neem seed oil have also been documented to have clinical instances of acidosis and renal damage in the body system.^[47] Quality control, identification, and standardisation of biomolecules on herbal products are the key obstacles of ethnopharmacological research for medicinal claims.



Figure 6.

3.2. Mentha Piperita

Peppermint (*M. Piperita*) is the world's oldest herbal treatment for a variety of ailments. Since 1000 BCE, dry peppermint has been cultivated, and its significance has been documented in ancient Egypt, Greece, as well as Chinese traditional medicine. Peppermint oil is a kind of essential oil. Significant antibacterial and antifungal action against Gram-negative and Gram-positive bacteria, yeast, and fungus, mostly as a result of its antibacterial and antifungal properties. as a result of the abundance of phytochemicals menthol and^[48] Menthone To the best of our knowledge, however, a research conducted of According to Saudi Arabia, 78 percent of non-hospitalized patients utilised compared to only 22% of hospitalised patients who did not have peppermint Due to the COVID epidemic, peppermint supplements are being used. Peppermint was linked to a reduced risk of COVID-19 infection. Chances of being admitted to the hospital.^[49]



Figure 7.

3.3 *Isatis indigotica*

Organic acids, lignans, alkaloids, nucleosides, flavonoids, steroids, and amino acids make up *Isatis indigotica* (*I. indigotica*). Antibacterial, anti-inflammation, immunoregulatory, cholagogic, and antiviral properties have been discovered in *I. indigotica* in previous investigations. Hepatitis B, influenza, herpes simplex, mumps, coxsackievirus, and cytomegalovirus are among the pathogens that it can suppress. It is frequently used in clinical practise to treat viral disorders such as parotitis, viral hepatitis, and viral influenza. As a result, *I. indigotica* may be beneficial in the treatment of COVID-19. Immune regulation is a function of *I. indigotica*, which promotes its antiviral actions. As a result, *I. indigotica* may be beneficial in the treatment of COVID-19, while more research is needed.^[50]



Figure 8.

3.4. *Allium sativum* and *Allium Cepa*

In Ethiopia, garlic (*Allium sativum*) and onion (*Allium cepa*) are extensively used as home remedies for a variety of ailments. The avian influenza virus (H9N2) was destroyed using onion, which has been used in traditional medicine for a long time to treat many diseases and infections.^[51] The technique of preparation, on the other hand, is critical, as boiling or fried onions are ineffectual. Onion is a strong choice for managing COVID-19 patients, according to researchers, because of its anti-inflammatory, antithrombotic, and antiviral

properties.^[52] Immunomodulatory, antibacterial, antioxidant, anti-inflammatory, anticarcinogenic, antihypertensive, antithrombotic, antidiabetic, antimutagenic, and prebiotic properties are the most common use. Sulfur-containing and non-sulfur-containing compounds are two types of active metabolites found in garlic. The main sulfur-containing active chemicals are allicin and alliin, whereas flavonoids and saponins are the main sulfur-free active compounds.^[53] Garlic's potential to suppress SARS-CoV-2 was determined in silico by creating hydrogen bonds between amino acids and the binding site of SARS-major CoV-2's structural protease and its bioactive components, with the protease responsible for viral generation.^[54] Garlic causes considerable overexpression of T helper cells, cytotoxic T cells, and NK cells, as well as downregulation of leptin, leptin receptor, TNF-, IL-6, and proliferator-activated receptor gamma (PPAR-) levels in COVID-19 patients.^[55] Because of its potential to influence cytokine secretion, immunoglobulin synthesis, phagocytosis, and macrophage activation, it might be a viable alternative for COVID-19 treatment.^[56]

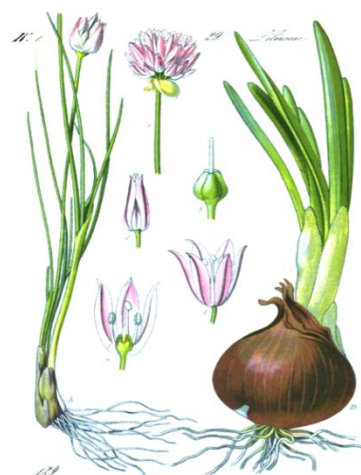


Figure 9.

3.5 *Psoralea corylifolia*

Psoralea corylifolia L is used to treat a variety of skin illnesses in Chinese medicine and traditional Ayurveda, including leukoderma, psoriasis, and leprosy.^[57] This plant's antibacterial and anti-inflammatory properties are also well-known.^[58] Six aromatic components were extracted from seeds of *Psoralea corylifolia*^[59] and inhibited the enzyme in a dose-dependent manner, with IC₅₀ values ranging from 4.2 to 38.4 M. Similarly, various natural compounds (e.g., homoharringtonine, ouabain, lycorine, tylophorine, 7-methoxycryptopleurine, and Silvestro) have shown antiviral activity against SARS-CoV at nanomolar concentrations.^[60] Clinical investigations of a few herbal compounds against SARS-CoV-2-3CLPro raised hopes for anti-SARS-CoV-2 medicines derived from plants. The 3CL protease inhibitor NLC-001, a plant product used orally as a dietary supplement, was recently approved by the US Food and Drug Administration.^[61]



Figure 10.

3.6. Glycyrrhiza Glabra

Glycyrrhizin, commonly known as glycyrrhizic acid (GLR), is a saponin derived mostly from the roots (Glycyrrhizae Radix) of the plant Glycyrrhiza.^[62] Two clinical isolates of SARS-associated coronavirus were shown to be resistant to GLR (FFM-1 and FFM-2). With an EC50 of 300 mg/ml, the drug was shown to reduce the virus's cytopathic action while being non-cytotoxic to host cells. GLR stopped the virus from replicating as well as penetrating and adhering to cells.^[62] At the time, the mechanism of action at the source of this activity was unknown, but a drug-induced generation of nitrous oxide synthase was described, implying that nitrous oxide might be responsible for viral replication inhibition.^[62] GLR was similarly active in infected Vero-E6 cells when tested against 10 clinical isolates of SARS coronavirus, although the activity was short-lived. The drug's fast metabolism restricts its exposure, preventing it from reaching an effective concentration.^[63] Modification of GLR structures, particularly to generate amino-acid conjugates and amide derivatives, can increase SARS-CoV-2 activity greatly, albeit at the cost of increased cytotoxicity.^[64]



Figure 11.

3.7. Malva sylvestris

Malva sylvestris is used to treat respiratory conditions such dry cough and pharyngeal and oral irritations.^[65,66] Flavonoids (e.g., delphinidin, apigenin, malvidin, myricetin, genistein, and derivatives, and kaempferol); mucilage (mostly galacturonic acids and glucuronic, glucose, galactose, fructose, trehalose, and rhamnose); tannins^[67]; hydroxycinnamic acid and derivatives; benzoic acid and derivatives. Malva sylvestris formulations have been explored for cough, according to preclinical research. Its isolated rhamnagalacturonan and mucilage were tested in cats for anti-tussive action. Both drugs repressed the cough reflex and reduced cough frequency, especially in the laryngopharynx.^[68] In-vivo models revealed analgesic and anti-inflammatory efficacy in another investigation.^[69] Malva sylvestris has long been used as a cough remedy, and its relaxing impact on the respiratory system may make it useful in the treatment of COVID-19 symptoms.^[70]



Figure 12.

Nutrient supplements

A robust immune system is the most important weapon against any type of viral illness. There have been several studies conducted in the past that show trace elements and vitamins play an important part in the immune system's regular functioning.^[71] In addition, there have been reports of increased resistance to viral infection as a result of their supplementation. In paediatric patients, vitamin D and A supplementation enhanced humoral immunity in conjunction with influenza vaccination.^[72] Exogenous Se supplementation, in combination with immunisation, has been found to effectively treat influenza illness.^[73] A wide range of herbals, nutraceuticals, and probiotics have also been discovered to be useful against viral infestations and immune response activation.^{[74],[75]}

4. Conclusion and future Perspectives

Herbal medicine has the potential to be a platform for dealing with various sorts of COVID-19 viral management. Remdesivir and Antiviral medication that has been approved by the World Health Organization (WHO) for use in emergency situations. Herbal therapy

and its bioactive components have the potential to be helpful in COVID-19 prevention and treatment. COVID-19 development can be hampered by herbal medicines that block SARS-CoV-2 multiplication and entrance into its host cells. Different biochemical components of plants are the most attractive herbal drink or fruit that may be introduced as efficient adjuvant components in COVID-19 therapy, as well as to lower fever and cough, the most frequent COVID-19 consequence via their anti-inflammatory impact. *Gymnanthemum*, *amygdalinum*, *Azadirachta indica*, *Nigella sativa*, and *Eurycoma longifolia* are some herbal preparations that can be employed. Numerous herbal medications, including as *G. glabra*, *Thymus vulgaris*, *Allium sativum*, *Althea officinalis*, and ginseng, may, on the other hand, be useful in the prevention and control of COVID-19 by increasing the immune system.

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