

# Herbal product in the treatment of COVID-19



**Daffodil**  
*International*  
**University**

## **Project On**

**Herbal product in the treatment of COVID-19**

## **Submitted To**

Department of Pharmacy  
Faculty of Allied Health Sciences  
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Bachelor of Pharmacy

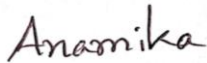
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# Herbal product in the treatment of COVID-19

## DECLARATION

I, hereby humbly declare that the dissertation work titled “Herbal product in the treatment of COVID-19, a requirement for the degree Bachelor of Pharmacy (B. Pharm) program under the faculty of Allied Health Sciences Daffodil International University, Bangladesh was carried out by me under the guidance of my supervisor during the study period. I am declaring that this project is my original work. I am also declaring that neither this project nor any part thereof has been submitted elsewhere for the award of Bachelor or any degree.

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# Herbal product in the treatment of COVID-19

## APPROVAL

This project, Herbal product in the treatment of COVID-19, submitted to the Department of Pharmacy, Faculty of Allied Health Sciences, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of Bachelor of Pharmacy and approved as to its style and contents.

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# **Herbal product in the treatment of COVID-19**

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My heartfelt greetings to Professor Dr. Muniruddin Ahamed, Professor, and Head of the Department of Pharmacy, Daffodil International University.

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Last but not least, I want to express my deepest appreciation to my parents and family, whose love and support have inspired and pushed me to continue my studies.

# **Herbal product in the treatment of COVID-19**

## **DEDICATION**

Dedicated to the Almighty God

And my family.

For their unwavering support, patience, and understanding, as well as their love.

## Herbal product in the treatment of COVID-19

**Abstract:** SARS-CoV-2, also known as COVID19, has infected individuals all over the world since its breakout in late December 2019. Coronavirus disease 2019 (COVID-19), caused by extreme acute respiratory coronavirus-2 (SARS-CoV-2), is a highly contagious disease that has already infected roughly a million individuals and killed a large number of people throughout the world. COVID-19 has a wide clinical spectrum, ranging from mild sickness with vague signs and symptoms of acute respiratory disease to severe respiratory pneumonia and septic shock. It can be transmitted from human to human by contact, air, water, utensils, and fomite. Self-isolation, relaxation, and water, including the use of NSAIDs solely in cases of severe fever, are now recommended for the self-management of SARS-Cov-2 sickness (COVID-19). In the absence of curative pharmaceuticals, various measures like herbal products are being investigated to slow the pandemic's wave. Acute respiratory infections have traditionally been treated with natural products and herbal medications. To analyze the advantages and dangers of certain herbal medications usually used to cure "respiratory infections" as adjuvant therapy in the current COVID-19 pandemic. This review focuses on several herbal products that have been shown to have an inhibiting impact on human coronavirus symptoms, as well as the herbal treatments that have recently been employed for COVID-19. Plants were chosen mostly from the WHO and EMA's list of species, but additional herbal treatments were also evaluated due to their extensive usage in respiratory disorders. According to this study herbal medicines like *Withania somnifera*, *Ocimum gratissimum*, *Cinchona officinalis*, *Curcuma longa*, *Althaea officinalis*, *Cymbopogon citratus*, *Foeniculum vulgare*, *Thymus vulgaris*, *Nigella sativa*, and *Silybum marianum* should be regarded as promising candidates because of their reasonable safety margins and emerging evidence for efficacy in the treatment of mild common flu and mild respiratory conditions. Although medicinal plants have the ability to cure COVID, there is a possibility that these therapies may have unfavorable side effects and will have a negative impact on lactating mothers. As a result, further research is needed to prove their usefulness and uncover compounds with potential therapeutic uses.

**Keywords:** COVID-19, epidemic disease, herbal approach, medicinal plants.

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**Chapter 1:**

**Introduction**

# Herbal product in the treatment of COVID-19

**1. Introduction:** The epidemic of Coronavirus SARS-Cov-2 disease (COVID-19) in Wuhan (China) and its worldwide spread has caused hundreds of thousands of death so far [1]. The first case of coronavirus was reported in December 2019, and the disease has become a pandemic to the world. The key factor is impaired immune regulation that plays a role in its pathogenesis and results in poor outcomes of COVID-19 patients. Coronavirus 2019 is a new type of infectious disease caused by severe acute respiratory syndrome that belongs to the coronavirus family. Coronavirus belongs to a class of single-stranded RNA viruses, which affect both humans and animals, causing respiratory, gastrointestinal, hepatic, and neurologic disease. [2]. Animal-to-human and human-to-human transmission were assumed to be the key cause after the first cases of the COVID-19 disease where the route of transmission as a droplet, contact, feco-oral, and maybe airborne or Trans placental were associated with direct access to the Wuhan Huanan Seafood Wholesale Market. The patient's most symptoms, including fever, cough dyspnoea, muscle soreness, and fatigue. Some patients have had a history of developing sputum, vomiting, hemoptysis, and diarrhea. Patients with mild symptoms have heavy fevers and mild fatigue but no signs of pneumonia [3]. People who are infected with the COVID-19 virus mainly experience mild to moderate respiratory illness and recover without requiring special treatment. Older people who are suffering from medical problems such as cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illnesses.

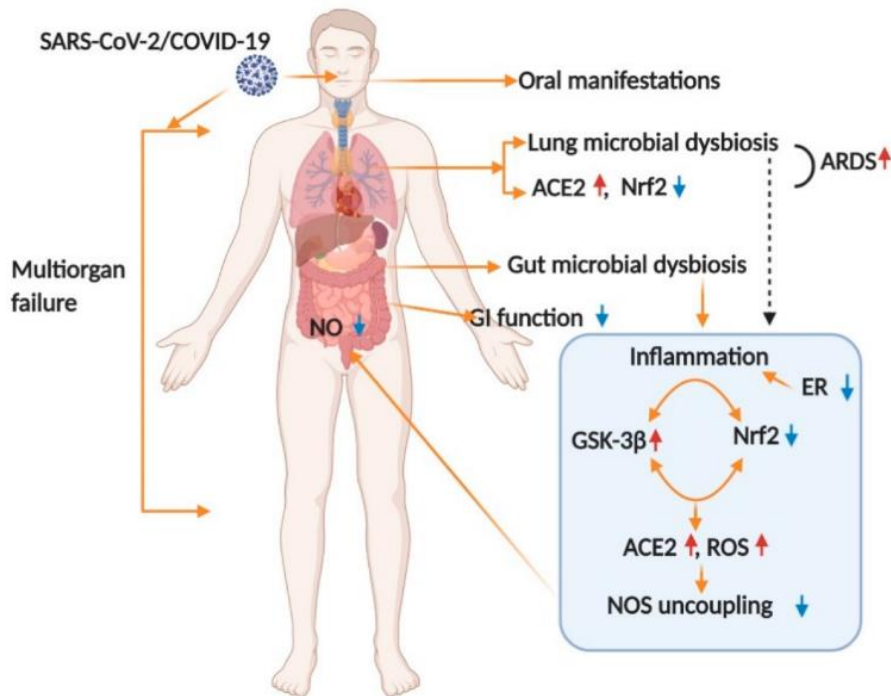


Figure 1: The theorized process of COVID-19 infection causing multiple organ failure is depicted in this diagram. Virus entry occurs when a viral protein binds to angiotensin-converting enzyme 2 (ACE-2). ACE-2 gene expression has been demonstrated to suppress nuclear factor erythroid 2-related factor 2 in oral tissues, lungs, vasculature, kidney, stomach, and colon (NRF2).

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Teens and adults without underlying medical conditions can self-manage their symptoms in isolation with a minimum of drugs and proper hygiene [1]. At the current time, there is no specific treatment for COVID-19. Furthermore, people in the community and researchers are trying to find the best way to cure or prevent the disease, including using herbal medicine. Since the immune status of patients plays an essential role in COVID-19 infection, an herbal medicine, which has an immunomodulatory effect, could have the potential as a preventive measure and even therapeutic agent for patients with COVID-19 infection [4]. In many countries, there are several herbal medicines registered for self-prescription. Their labeling establishes that these medicines are indicated for the treatment of common cold and flu symptoms based on traditional use only. Traditional herbal medicines are getting significant attention in global health debates. India, the United States of America (USA), China, Nigeria, and the World Health Organization - WHO have all made substantial research investments in traditional herbal medicines[5]. A kind of herbal method Aromatherapy has been used in Egypt and India for thousands of years to treat different diseases and multiple studies have confirmed the anti-microbial and anti-viral efficacy of essential oils. In the 90 studies on traditional Chinese medicine for the human severe acute respiratory syndrome (SARS), they found positive but inconclusive results on the effectiveness of the combination treatment, using traditional Chinese medicine as the complementary agent. The main focus of the document is to explore what medicines and herbal products/foods are being used by the public as a preventive measure against Covid-19, as well as to manage symptoms associated with Covid-19.

### **1.1. Background information about the coronavirus:**

**Symptoms of COVID-19:** The symptoms of the early stages of the disease are non-specific. The following are the most prevalent symptoms:  
Fever, cough, and exhaustion, taste, or olfactory loss.

Less prevalent symptoms:

Sore throats, aches, and pains are some of the

Diarrhea, a rash on the skin, or the coloring of the fingers or toes are all possible symptoms. Eyes that are red or irritated

Severe symptoms:

Breathing difficulties or shortness of breath, speech or mobility loss, as well as confusion and pain in the chest.

The most prevalent radiographic abnormalities in individuals with COVID-19, according to several investigations, were ground-glass opacities in the lungs. SARS-CoV-2 can also harm the cardiovascular and gastrointestinal systems, as well as induce abrupt renal failure [6].

### **1.2. COVID-19 transmission mode:**

Coronavirus spreads by a variety of routes, including contact, droplet, aerosol, fomite, fecal-oral, transmitted by sperm, mother to child, and animal-to-human transmission. SARS-CoV-2 infection is mostly associated with respiratory disorders ranging from moderate to severe, as well as mortality, although some patients infected with the virus exhibit no symptoms [7].

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Early COVID-19 symptoms were limited to a fever and a cold. As a result, COVID-19 diagnosis is difficult, and SARS-Cov-2 has a high transmission potential, further complicating the issue. There are a large number of asymptomatic people who unwittingly contribute to the disease's spread. The World Health Organization (WHO) has raised awareness of COVID-19, stating that isolation, prevention, infection control, and treatment of affected people are the most important measures in reducing infectious illnesses. The activities listed below will aid in preventing the spread of the virus. Shielding is defined as staying at home and avoiding close contact with anyone, healthy or sick.

**Chapter 2:**

**Literature  
review**

# Herbal product in the treatment of COVID-19

## 2. Literature review:

### 2.1. Silveira, D., Prieto-Garcia, J.M., Boylan, F., Estrada, O., Fonseca-Bazzo, Y.M., Jamal, C.M., Magalhães, P.O., Pereira, E.O., Tomczyk, M. and Heinrich, M., 2020. COVID-19: is there evidence for the use of herbal medicines as adjuvant symptomatic therapy?

Self-isolation, relaxation, water, and the use of NSAIDs solely in cases of severe fever are now recommended for the self-management of SARS-Cov-2 sickness (COVID-19). To analyze the advantages and dangers of certain herbal medications usually used to treat "respiratory disorders" as adjuvant therapy in the current COVID-19 pandemic. The benefits/risks evaluation of herbal remedies was determined to be favorable in five cases (*Althaea officinalis*, *Commiphora molmol*, *Glycyrrhiza glabra*, *Hedera helix*, and *Sambucus nigra*), promising in twelve cases (*Allium sativum*, *Andrographis paniculata*, *Echinacea angustifolia*, *Echinacea purpurea*, *Eucalyptus globulus* essential oil, *Justicia pectoralis*, *Magnolia officinalis*, *Mikania glomerata*, *Pelargonium sidoides*, *Pimpinella anisum*, *Salix* sp, *Zingiber officinale*). People with early and moderate flu symptoms who had no underlying illnesses were the target demographic. The findings imply that numerous herbal medicines have higher safety margins than reference pharmaceuticals, as well as sufficient evidence to begin a clinical conversation regarding their possible use as adjuvants in the treatment of early/mild common flu in otherwise healthy people in the COVID-19 study. While these herbal remedies will not cure or prevent the flu, they may help patients feel better in general and allow them to customize their treatment plans.

### 2.2. Nugraha, R.V., Ridwansyah, H., Ghozali, M., Khairani, A.F. and Atik, N., 2020. Traditional herbal medicine candidates as complementary treatments for COVID-19: a review of their mechanisms, pros and cons.

Coronavirus illness is a novel viral disease caused by the coronavirus family's severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The disease became a pandemic after the first case was recorded in December 2019. One of the elements involved in its etiology is impaired immunological modulation, which leads to poor outcomes in COVID-19 patients. Many investigations have been conducted using medication candidates as antivirals or immunomodulators. However, the findings of these studies revealed that the drug candidates were ineffective in combating the condition. Meanwhile, some people feel that taking herbal immunomodulators can help to prevent or even treat COVID-1 infection. However, there has been no particular preclinical and clinical research to investigate the effects of herbal immunoregulators. Based on basic notions from past investigations, several natural substances may be beneficial in the treatment of COVID-19.

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### **2.3. Fatima, S., Haider, N., Alam, M.A., Gani, M.A., Ahmad, R. and Taha, M., 2021. Herbal approach for the management of COVID-19: an overview.**

COVID-19 is the most recently found coronavirus infectious illness that can cause a worldwide pandemic. COVID-19 has a wide clinical spectrum, ranging from mild sickness with nonspecific signs and symptoms of acute respiratory disease to severe respiratory pneumonia and septic shock. It can be transmitted from animal to human by contact, air, water, utensils, fomite, and the feco-oral route of blood. The term "epidemic sickness" is used in Unani medicine to designate a variety of herbal medications. Another great Unani scholar, Avicenna (980–1037 AD), advised that during epidemics, mobility be restricted, self-isolation be practiced, and fragrant herbs be sprayed around the occupants. The herbal method is centered on single plants such as Sapistan (*Cordia myxa*), Bahidana (*Cydonia oblonga*), Khatmi (*Althea officinalis*), Khubazi (*Malva sylvestris*), Zafran (*Crocus sativus*), Murmuki (*Commiphora myrrha*), Darchini (*Cinnamomum zeylanicum*), Habtus Saud It is traditionally used by the majority of herbalists.



**Chapter 3:**

**Goal of study**

## Herbal product in the treatment of COVID-19

### 3. Goal of study:

- To assess herbal medicine practice for the prevention and treatment of COVID-19.
- To provide best possible outcome a for selection herbal product to treat COVID-19.
- To provide a benefits/risks assessment for selected herbs indicated for “respiratory diseases”
- To provide overall safety margin on herbs that are selected to treat COVID-19 symptoms
- Within the present context of the COVID-19 pandemic, to apply a decision-making framework to give a benefits-to-risks evaluation for chosen herbal remedies typically prescribed for "respiratory disorders."

**Chapter 4:**  
**Method**

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## 4. Method:

This study is based on a literature review of published scientific studies from 2020 to 2021 on traditional or herbal products that are used to treat COVID-19 symptoms. Herbal products that have been determined to be utilized for COVID-19 are then employed to uncover further supporting articles about their suggested usage prior to COVID-19's appearance. These data were analyzed to determine the basis or indication for using them to treat COVID-19. Furthermore, data on these products' indications for colds, flu, and respiratory conditions were collected and analyzed to see if the choice to utilize them for COVID-19 is successful. These findings are also utilized to define these products based on their chemical composition, potential adverse effects, impact on pregnant or breastfeeding mothers, and overall product safety. The majority of this research is done using internet resources like Google Scholar, PubMed, and ScienceDirect. "COVID-19" and "herbal medication" were among the search terms utilized. Due to its application to COVID 19, more studies into the particular product will be conducted. In addition, other relevant papers are cited in the narrative portion of this page to assist in illustrating the state of herbal product use in general, as well as other related issues. Furthermore, the pie chart is done by using Microsoft excel. The focus of this article is to identify several of these herbal products to improve COVID-19 symptoms

**Chapter 5:**

**Result and  
Discussion**

# Herbal product in the treatment of COVID-19

## 5.1 Selection of herbal products:

The herbs were mostly chosen from the WHO and EMA's lists of species. Other herbal medicines, however, were evaluated in some situations due to their widespread usage in respiratory disorders. From reliable sources, preclinical and clinical data on their effectiveness and safety were gathered [1]. Herbal medicine, often known as herbalism or botanical medicine, is a medical approach that uses plants or plant extracts to treat illness. Herbal medicine has been utilized to heal sickness and aid biological processes by many different civilizations throughout the world since ancient times. Herbs are the leafy green or blooming sections of a plant, whereas spices are made from other (typically dry) components of the plant, such as seeds, bark, roots, and fruits. The term "herb" is frequently used as a synonym for "herbaceous plant" in botanical English. In the previous year, up to 33% of the population employed some type of unorthodox therapy. Back pain, headaches, anxiety, cancer, and sleeplessness are some of the reasons patients select this therapy. People select alternative treatments. They are afraid of drug side effects because they heard about them from a friend. After all, they are unsatisfied with traditional drug therapy, or because alternative practitioners provide them more personal attention. Many plants are used topically to treat the skin in various ways. Essential oil extracts are normally diluted in a carrier oil before being applied to the skin. When applied directly, many essential oils can burn the skin or have a high dosage; diluting them with olive oil or another food-grade oil like almond oil can make them safe to use as a topical. Other topical administration techniques include salves, oils, balms, creams, and lotions. Herbal oil extractions are used in the majority of topical treatments. Certain phytochemicals can be extracted into a food-grade oil by soaking plants in it for weeks to months. This oil may then be used to make salves, creams, and lotions, or it can simply be used as a topical oil. Because preventative and therapeutic drugs have not been identified and recommended for administration to patients, many individuals in the community utilize herbal remedies to treat coronavirus sickness. Combining anti-inflammatory and antiviral medications can be more effective than using either strategy alone. Based on in vitro evidence of SARS-infection-induced pro-inflammatory cytokine production and prevention of human severe acute respiratory syndrome coronavirus replication. Many herbal species can now be utilized to treat COVID-19 patients. Allergic responses and gastrointestinal (GI) disorders are two common side effects of using therapeutic herbs. They are utilized in pregnancy and breastfeeding, newborns, children, and the elderly, as well as individuals with recognized severe disorders, after being evaluated by a certified healthcare practitioner. National authorities control the use of pharmaceutical items to guarantee their quality and safety. Adulteration, contamination, and the presence of naturally occurring toxins in amounts exceeding those authorized may make other goods dangerous [1].

### 5.1.1 *Withonia somnifera*:

Winter cherry, Indian ginseng, and ashwagandha are all names for *Withania somnifera*. The evergreen plant, Ashwagandha, grows across Asia and Africa. In the traditional medical system, Ashwagandha is a highly useful medicinal herb with several therapeutic effects. The plant develops as a shrub with branching, reaching a height of roughly 150 cm with leaves up to 10 cm long; blooms are greenish or bright yellow in color, fruits/berries are orange in color when ripe, and seeds are generally distributed in June or July [8]. It's mostly used to alleviate tension. There is little evidence for its use as an "adaptogen." This is one of the important herbs of Indian Ayurveda

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(the traditional system of medicine in India) used for millennia as a Rasayana for its wide-ranging health benefits.).

A glycoprotein extracted from the root of *Withania somnifera* displays antibacterial action against several bacteria and phytopathogenic viruses. Proteins such as *Withania somnifera* glycoprotein and Withania lectin-like protein have antimicrobial, anti-snake venom toxicity, and antimicrobial activities.

According to current molecular docking studies, the most important inhibitors that function against 3C-like main protease (3CLpro) are Withanolide D and Withaferin A, which may be tested against COVID-19 in pre-clinical and clinical studies.



Figure 2: *Withania somnifera*

### 5.1.1.1 Indication for COVID-19:

Through modification of host Th1/Th-2 immunity, *Withania somnifera* can be a beneficial agent in the therapy of coronavirus illness. *Withania somnifera* may help to induce antiviral immunity (via enhanced IFN-gamma responses) and optimal anti-inflammatory activity (by down-regulation of IL1, IL-6, TNF-alpha, and other inflammatory mediators), which are the major objectives of COVID-19 [9].

As an antiviral agent, withaferin (WA) plays a critical function. The binding energy of its primary phytochemicals is projected to be lower than that of the pharmaceutical inhibitor. The interaction

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of these phytochemicals with the primary protease may slow the replication and transcription of viruses [10].

**5.1.1.2 Chemical Constituents:** *Withania somnifera* plants biologically active chemical constituents are including alkaloids (isopelletierine, anaferrine, cuseohygrine, anahygrine, etc.), steroidal lactones (withanolides, withaferins)

**5.1.1.3: Clinical investigation:** The antiviral properties of *Withania somnifera* may cause viral entry and subsequent life cycle disruption. The antiviral potential of WS metabolites against SARS-CoV-2 proteins was investigated using a computational molecular docking method. COVID-19 shows pathophysiological milestones such as viral entry followed by a variety of clinical symptoms, particularly in symptomatic people. A tiny percentage of people have an immune response marked by cytokine storm and hyper inflammation, leading to multi-organ failure. *Withania somnifera* has been found to protect vital organs and reduce prior pathophysiological symptoms of disease progression.

**5.1.1.4 Dosing:** There isn't a lot of information on dosing. *W. somnifera* root powder has been used in conjunction with various preparations at daily doses ranging from 120 mg to 2 g.

**5.1.1.5 The side effect, precautions, and pregnancy/lactation:** Small-to-medium dosages of ashwagandha are normally tolerated by most people. There hasn't been enough long-term research to thoroughly investigate the potential adverse effects. Large doses of ashwagandha can cause stomach pains, diarrhea, nausea, and vomiting. It's possible that this is caused by inflammation of the intestinal mucosa. Ashwagandha has been shown to have anti-abortifacient effects. An individual should stay away from it. Acute toxicity of *W. somnifera* is modest; at reasonable doses, ashwagandha is nontoxic

**5.1.1.6 Overall assessment:** *Withania somnifera* has the ability to inhibit viral multiplication and transcription, making it useful in the treatment of early COVID-19 symptoms. It also has low toxicity, making it safe to use. The clinical data is strong, and there have been no serious concerns raised about this herbal treatment.

### 5.1.2 *Allium sativum*:

Garlic, also known as *Allium sativum*, is a highly fragrant bulb plant native to Kazakhstan, Uzbekistan, and Western China. Garlic is one of the oldest known medicinal herbs, having been used to treat a variety of human diseases since ancient times. Garlic's primary medical properties include lowering blood pressure and cholesterol, combating infections, and preventing cancer. Garlic's name may have come from the Celtic word 'all,' which means pungent. Garlic is a bulbous blooming plant that belongs to the genus *Allium*. Onions, shallots, leeks, chives, and Chinese onions are near cousins.

Garlic (*Allium sativum*) is a bulbous perennial blooming plant with a long flowering season. This plant has a long, upright blooming stem that may reach a height of one meter (3 ft). The leaf blade of *Allium sativum* is flat, linear, firm, and about 1.25–2.5 cm (0.5–1.0 in) broad, with a sharp tip. In the Northern Hemisphere, garlic plants can produce pink to purple blooms from July through September. The odoriferous bulb of this plant has outer layers of thin sheathing leaves that surround an inner sheath that encloses the clove. Typically, the bulb includes 10 to 20 asymmetrically shaped cloves, with the exception of those closest to the center [11].



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Figure 3: *Allium sativum*

*Allium sativum* has been found in Egyptian pyramids and ancient Greek temples dating back to the beginning of recorded history. Early physicians such as Hippocrates, Pliny, and Aristotle advocated the use of garlic for a variety of medicinal purposes. Garlic was given to laborers to enhance vigor and increase work capacity in various civilizations. Garlic was suggested by Hippocrates, a respected physician, for a range of ailments. Garlic has long been used to alleviate the symptoms of the common cold in adults and children over the age of 12. As a result, garlic is regarded as a traditional herbal medicine for the treatment of cold symptoms [1].

**5.1.2.1 Indication for respiratory and cold flu:** Garlic has been suggested by scientists for several medical applications. Garlic is the second most popular dietary supplement. Garlic's sulfur-containing components, high trace mineral content, and enzymes provide it with antiviral, antibacterial, antifungal, and antioxidant qualities. Garlic is used to cure colds, coughs, and other flu-like symptoms in the respiratory system. Garlic has been demonstrated to be effective in preventing colds and flu. Garlic compounds were also employed for antiviral, bacteriostatic, and diaphoretic reasons. Garlic can be used to treat chronic bronchitis and recurrent upper respiratory tract infections [1].

**5.1.2.2 Chemical Constituents of garlic:** Garlic includes 33 sulfur compounds, as well as many enzymes, 17 amino acids, and minerals like selenium. Sulfur compounds are found in greater concentrations in this species than in any other *Allium* species. Garlic's strong odor, as well as many of its medical properties, is due to sulfur compounds [12].

Alkaloids, Tannins, Carotenoids, Saponin, Flavonoids, Steroids, Cardenolides, Titratable acidity, Salt, and other chemicals are found in the major chemical makeup of garlic. Amino acids are present in this area (arginine, alanine, asparagine, aspartic acid, histidine, proline, alanine, valine) Compounds containing sulfur have (allyl methyl trisulphide, diallyl trisulfide, allicin, mercaptan, diallyl disulfide).

**5.1.2.3 Dosing:** It has been proposed that the following dosages be used: 2–5 g of fresh raw garlic; 0.4–1.2 g of dried garlic powder; 2–5 mg of garlic oil; 300–1,000 mg of garlic extract (as a solid substance); 2,400 mg of aged garlic extract per day (liquid). Consume it with a meal. In clinical

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trials, 180 mg of allicin per day was found to be effective in preventing the common cold, and at least 5.5 g of raw garlic was found to be effective in preventing prostate cancer. In antihypertensive studies, garlic powder doses varied from 300 to 2,400 mg/day for up to 24 weeks.

**5.1.2.4 Clinical investigations:** Garlic extract has been proven to have antiviral properties against a variety of viruses, including the flu and respiratory illnesses [13].

Influenza B virus, Herpes simplex virus type 1, Human Cytomegalovirus (HCMV), Herpes simplex virus type 2, Parainfluenza virus type 2, and vesicular stomatitis virus are among the viruses that are susceptible to garlic. Garlic's main biologically active component, allicin, has antimicrobial properties. However, there is no clinical evidence to support the use of garlic in the treatment of upper respiratory infections, although it does greatly aid in the prevention and treatment of symptoms of the common cold. Another trial suggested that consuming the aged garlic extract could reduce the severity of cold symptoms reported [1].

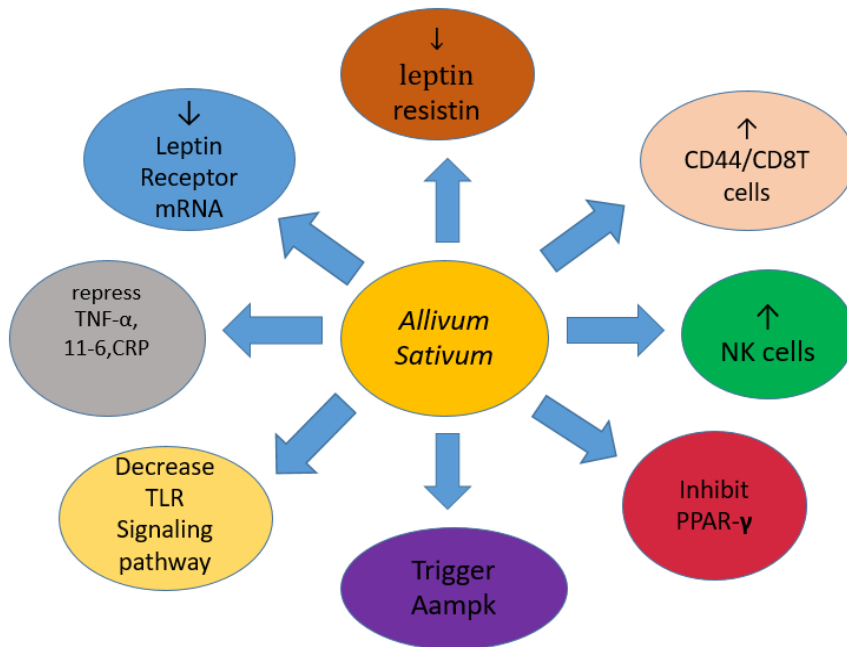


Figure 4: Mechanism of *Allivum sativum*.

**5.1.2.5 The side effect, precautions, and pregnancy/lactation:** The most prevalent side effects of garlic consumption include body odor and foul breath. Mild GI side effects (bloating, flatulence, and nausea) have been noted often with usage. Garlic burns have been reported when applied topically. The risk of postoperative and spontaneous bleeding may be increased if excessive amounts are consumed. Garlic has been linked to allergies, asthma, pneumonia, contact dermatitis, and anaphylaxis, but nothing is known about its toxicity. For 30 days, rats were fed raw garlic, which resulted in lower testosterone levels and impaired spermatogenesis. Patients should avoid using antiplatelet medicines at the same time. There is a known allergy to garlic and its

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components. Garlic can be consumed in normal dosages throughout pregnancy and nursing. Nursing moms' drinking, on the other hand, may affect the infant's behavior during breastfeeding, producing greater sucking and extended attachment to the breast. It has been used as an emmenagogue in the past.

**5.1.2.6 Overall assessment:** Even though garlic can give relief from cold symptoms since the early times this herbal medicine cannot relieve flu symptoms. Although it may indirectly provide anti-inflammatory and soothing effects on the upper respiratory tract it has also an antiplatelet effect. So its safety is at a medium level.

### 5.1.3 Echinacea purpurea:

*Echinacea purpurea*, also known as *Brauneria purpurea*, *Echinacea purpurea* var. *arkansana*, *Rudbeckia purpurea*, and other names, is a perennial medicinal plant having significant immunostimulatory and anti-inflammatory qualities, particularly for the relief of cold symptoms. Much research has shown that this plant possesses anti-anxiety, anti-depression, cytotoxicity, and anti-mutagenicity properties [14]. White blood count, which is considered important by extracts. Echinacea inhibits the formation of the hyaluronidase enzyme in bacteria, which makes cells more vulnerable to infection. It's a natural antibiotic that's gentle on the body.

*Echinacea purpurea*, popularly known as feverfew leaf, is an herbaceous perennial that grows to be 120 cm (47 in) tall and 25 cm (10 in) wide when fully grown. It blooms throughout the summer and into the autumn, depending on the temperature. Purple coneflower, also known as *Echinacea purpurea*, is a coarse, rough-hairy herbaceous perennial native to damp prairies, meadows, and open forests in the central and southeastern United States (Ohio to Michigan to Iowa, south to Louisiana and Georgia). Throughout the summer, daisy-like purple coneflowers (up to 5" in diameter) bloom on stiff stalks with coarse, ovate to broad-lanceolate, dark green leaves. Freshly cut or dried flowers are both acceptable. The dead flower stems will remain erect well into the winter, and if flower heads are not removed, the blackened cones may be visited by goldfinches or other birds that feed on the seeds

*Echinacea purpurea* preparation can be made in the form of extracts, tinctures, teas, and sprays. This herb is used for the treatment of respiratory infections by many Native Americans [15].

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Figure 5: *Echinacea purpurea*

**5.1.3.1 Indications:** After studies revealed that *E. purpurea* extracts have antiviral activity, the use of *E. purpurea* extracts to treat viral illnesses became widespread. This herbal treatment is meant to relieve the symptoms of respiratory illnesses such as the common cold [1]. It's debated if this plant has anti-inflammatory or immunostimulatory qualities. Due to its direct virucidal effect, echinacea extract was found to be a one-of-a-kind herbal antiviral therapy for viruses with membranes in tests. RSV (MIC100, 2.5 g/mL) and Herpes simplex virus (MIC100, 0.39 g/mL) are both susceptible to echinacea therapy. When compared to a virus without a membrane, the MIC100 level for rhinoviruses is 800 g/mL, and it is higher in adenoviruses. The human coronavirus is an enveloped virus, so it might be a favorable target for *E. purpurea*'s activity, leading to a COVID-19 therapy [15].

**5.1.3.2 Chemical Constituents:** Echinacea's chemical contents are well-known; physiologically active ingredients include volatile oils (including pentadecadiene, Alkylamides, and polysaccharides). Pentacene, ketoalkynes, and ketoalkenes), alkamides (mostly a combination of isobutyl amides), polyalkenes, polyalkenes, caffeic acid derivatives, and polysaccharides are all markers for caffeic acid derivatives [16].

**5.1.3.3 Dosing:** Supplements, beverages, lotions, mouthwashes, and throat sprays all include echinacea. Echinacea components are extracted from various plant sections, species, and variations in commercial preparations. The dosage varies greatly depending on the product. Solid formulations should be preferred over preparations that give the extract to the upper respiratory tract.

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**5.1.3.4 Clinical Investigation:** Echinacea excelled both in terms of lowering the duration of the common cold and in strengthening the immune system. This preparation has been clinically tested for flu and cold, although other studies have been unable to establish a definite advantage. In ex vivo investigations, protection was shown against a variety of respiratory viruses, although only at greater dosages for specific preparations.

*Echinacea purpurea* caused macrophages to produce more cytokines, including IL-10, TNF-, and IL-1. Macrophages are believed to have a continual ability to phagocytose SARS-CoV-2 by producing TNF and other proinflammatory cytokines as part of the humoral immune response.

These cytokines can assist the supporting immune cell activities under some circumstances. A study shows that coronavirus-affected patients are being treated in ICU with severe clinical features that had a high level of innate cytokines IL-2, IL-10, IL-7, TNF- $\alpha$ , chemokines IP-10, MCP-1, and MIP-1A. By this report can be observed that Covid-19 symptoms gravity are connected with cytokine storm [16].

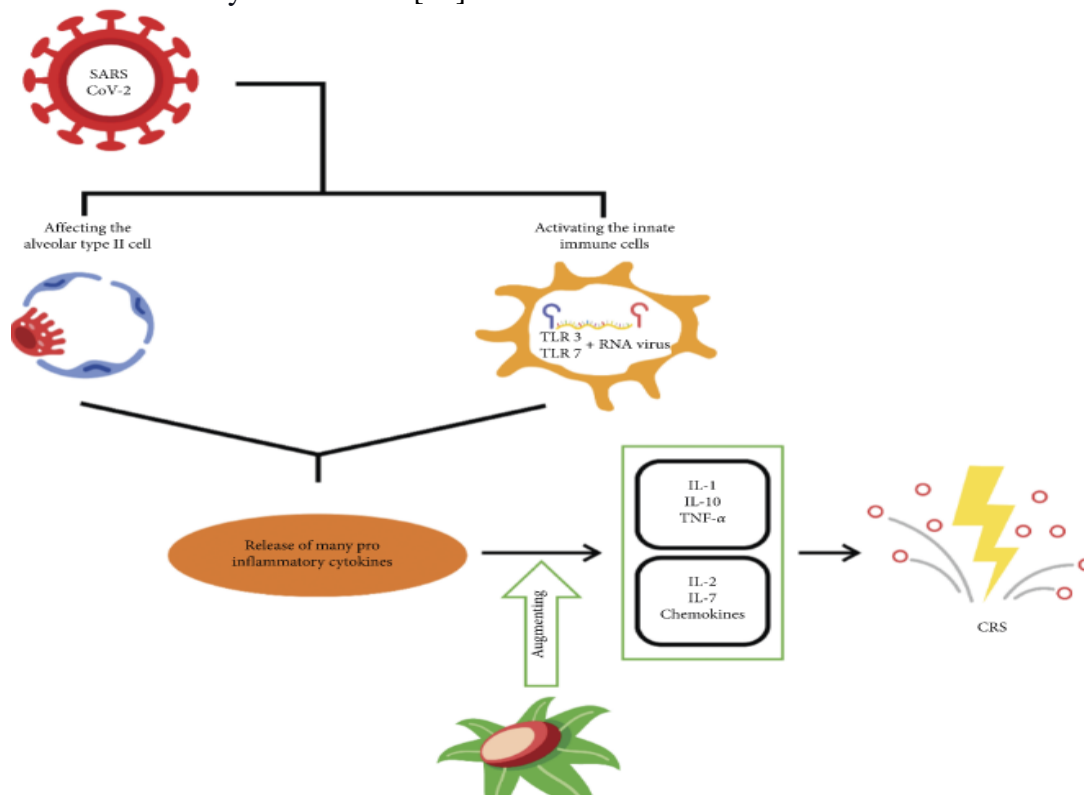


Figure 6: Echinacea increases the production of IL-1, IL-10, and TNF-in COVID-19, resulting in cytokine release syndrome.

**5.1.3.5 Contraindications, Pregnancy/Lactation, and Adverse reaction:** Patients with rheumatoid arthritis, systemic lupus erythematosus, leukemia, multiple sclerosis, TB, and HIV infection should avoid echinacea. There is a scarcity of information on the safety and efficacy of the drug during pregnancy and breastfeeding. Oral echinacea consumption at typical doses is safe during pregnancy, according to limited clinical data, expert opinion, and long-term traditional practice. During breastfeeding, echinacea should be taken with care. Stomach discomfort, constipation, diarrhea, heartburn, vomiting, and rash are the most prevalent adverse effects. According to inconsistent results, echinacea should not be administered in any condition that might be impacted by immunological activation or suppression, such as HIV, etc.



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**5.1.3.6 Overall assessment:** Echinacea safety can be estimated as medium. It is useful in treating cold and can also exert a soothing effect on the respiratory tract to relieve respiratory problems. Although a diverse amount of studies informed that it can help prevent and treatment of a cold vigilance should need in case of covid-19 to avoid immunostimulation in complications in later phases of the disease.

### 5.1.4 *Ocimum gratissimum*:

*Ocimum gratissimum*, often known as basil or basil-clove, is an herb that is used as a condiment in the human diet as well as for its medicinal benefits. *Ocimum gratissimum* is a traditional herb and culinary spice that has been used to heal a variety of ailments.

The essential oil of *Ocimum gratissimum* includes eugenol, which has antimicrobial properties. African basil, or *Ocimum gratissimum*, is a fragrant perennial plant with a stem that is upright, round-quadrangular, much-branched, glabrous, or pubescent, and grows to be 1-3 meters tall. And the base of this plant is woody, with the skin peeling in strips.



Figure 7: *Ocimum gratissimum*

It produces an essential oil that is commercially farmed and marketed to a variety of nations. The oil is used in the ceremonial washing of corpses in Indonesia, and the plant is commonly grown in cemeteries. It is commonly utilized in religious rites and rituals in India. African basil essential oil is useful to treat monogenean parasites in freshwater fish [17].

**5.1.4.1 Indication for cold flu and respiratory condition:** African basil is a stimulating antispasmodic that expels internal parasites and reduces fevers. Internally, the leaves and stems of this plant are used to cure a variety of ailments, including colds and influenza, fever, asthma, and bronchitis [18].

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**5.1.4.2 Chemical Constituents:** The principal components of eugenol, thymol, and 1,8-cineol in this plant's essential oil are eugenol, thymol, and 1,8-cineol. And there are quercetin and derivatives, luteolin and derivatives, kaempferol and derivatives, catechin, epicatechin, and caffeic acid in the phenolic molecule [1].

**5.1.4.3 Clinical Investigation:** *Ocimum gratissimum* is a well-known herb that has been utilized in Indian medicine for centuries. According to folklore medicine, it can be used to treat headaches, fevers, diarrhea, pneumonia, and other ailments. The majority of the claims are supported by research and review utilizing various in vitro and in vivo biological evaluation approaches [19]. This herbal plant has been scientifically proven to be effective in the treatment of cough. In OVA-sensitized guinea pigs, an aqueous extract of *O. gratissimum* was tested for anti-tussive and anti-asthmatic properties.

The aqueous extract of this medicinal plant had no influence on pre-convulsive dyspnea, but it did significantly lower the amount of tracheal liquid, even if it did not affect fluid viscosity, and it was reduced by more than 80% [20].

**5.1.4.4 Dose:** The herbal remedy is taken as an infusion 3-4 times a day with 1-3 g in 150 ml boiling water. Fresh *Ocimum gratissimum* leaves were dried in the oven at 60°C for 30 minutes after being maintained at 80°C for 10 minutes to cease enzyme activity. The leaves were then air-dried before being crushed into a coarse powder, which is how the medication is made.

**5.1.4.5 Contradiction, pregnancy/lactation:** There are no known contraindications, and there is no information on *O. gratissimum*'s toxicity, but there is a paucity of research on its safety and efficacy in pregnancy and lactation. *O. gratissimum* may have abortifacient properties. Because this medicinal plant contains estragole, a naturally occurring genotoxic carcinogen, it should only be administered for a brief period of time.

**5.1.4.6 Overall assessment:** Although because of estragole long-term use is prohibited and it may have some abortifacient effects but there is no evidence it is toxic or have a serious side effect. This plant is traditional to use as cough therapy to treat upper respiratory conditions and it is effective so its safety can be rated high.

### 5.1.5 *Curcuma longa*:

Turmeric is a blooming plant with underground rhizomes belonging to the *Curcuma longa* ginger family. *Curcuma longa* has been used in traditional Indian and folk medicine for thousands of years to treat a variety of ailments including inflammation, infectious infections, and gastric, hepatic, and blood issues. *Curcuma longa* has long been recognized as a medicinal herb used to cure a variety of ailments and disorders, but it is currently mostly utilized as a spice, a natural food coloring, and for its culinary taste. It is widely used to flavor or color curry powders, mustards, and cheeses, and has a warm, bitter flavor. Due to the fact of that curcumin and other chemicals in turmeric might decrease swelling, it is often used to treat conditions that involve pain and inflammation.

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Figure 8: *Curcuma longa*

*Curcuma longa* grows to a height of approximately 1 meter (3.3 ft). The leaves are long and simple, with long petioles (leaf stems). The leaves emerge from rhizomes that branch slightly beneath the soil surface. Plant rhizomes are scaly and brown in older rhizomes, whereas juvenile rhizomes are pale yellow to brown-orange in color.

The little yellow-orange blooms bloom in the axils of waxy bracts that are often light green or purple-tinged. The stem bracts at the top of the plant's inflorescence are absent of flowers. The higher ends are tapering and the color ranges from white to green with a reddish-purple hue [21].

**5.1.5.1 Indication for cold, flu respiratory condition:** It has mostly been utilized as a medication or supplement in Asian nations. Antioxidant, anti-inflammatory, and anti-cancer properties are all properties of this medicine. It is also used to treat a variety of other disorders, including diabetes, cardiovascular disease, obesity, allergies, and asthma [15]. The common cold is treated with turmeric steam inhalation. Turmeric in a glass of warm milk is a popular and effective technique to fight colds and coughs. Drinking a glass of warm turmeric milk before bedtime might help you recover quickly from a cold or cough.

**5.1.5.2 Chemical Constituents:** *Curcuma longa* includes curcuminoids, demethoxycurcumin, and bisdemethoxycurcumin, which is a combination of curcumin, in amounts ranging from 3-6 percent polyphenolic compounds.



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Curcuminoids are the primary component of *Curcuma longa* that controls various biological processes [22]. Turmeric includes 96.4 percent carbohydrates, 6.3 percent protein, 5.1 percent fat, 3.5 percent minerals, and 13.1 percent moisture [15].

**5.1.5.3 Clinical investigation:** Turmeric, which active constituent is *Curcuma longa*, has been studied in several experimental and clinical trial studies because it has antiviral, antinociceptive, anti-inflammatory, antipyretic, and antifatigue effects that may be useful for treating covid-19 patients with colds, fevers, and respiratory conditions [23]. *Curcuma longa* can be utilized to prevent COVID-19 infection since it is a high-risk individual for SARS-CoV-2 infection. This occurs because the new coronavirus has the ACE2 receptor, which is also involved in the hypertension process. Since Curcumin is a RAAS inhibitory agent so it increases the production of ACE2 and it prevents the development of the disease. So for treatment of covid-19 curcumin can use [15].

**5.1.5.4 Dose:** For commercial producers, *Curcuma longa* is typically offered in capsule form. The most common dose is one to three 500 mg capsules given once or twice a day, with or without meals. Patients took one 500 mg capsule twice a day, with or without meals, for eight weeks to cure a variety of ailments, according to studies. Turmeric root powder has long been used as a stimulant and carminative in doses ranging from 0.5 to 3 grams per day. For ulcer therapy, 3 to 6 g/day has been used. Clinical studies generally employ a daily oral dosage of 3,600 mg. Turmeric at higher dosages might cause gastrointestinal problems.

**5.1.5.5 Contradiction, pregnancy/lactation:** CRS, or cytokine storm, is a term used to describe certain COVID-19 patients who have hyperinflammatory and hypercytokinaemia. Turmeric can enhance the production of pro-inflammatory cytokines, which can aggravate the illness [15]. Curcumin should not be used during pregnancy or nursing due to its emmenagogue and uterine stimulating properties. In individuals with gallstones or a bile duct or tube obstruction, this medical treatment should be avoided.

**5.1.5.6 Overall assessment:** This plant is very useful in antiviral and common cold, flu, and respiratory condition and it has also an immunostimulatory effect as well as a well-defined anti-inflammatory effect. Although it has various contradictions it has diverse beneficial properties. So its safety can be rated as high.

### 5.1.6 *Andrographis paniculata*:

*Andrographis paniculata* (*Andrographis*) is a South Asian plant endemic to the region. *Andrographis*, green chiretta, Chuan Xin Lian, Kalmegh, king of bitters are some of the other names for this plant.

This is commonly utilized in Ayurveda, a traditional Indian medicinal system. This medical plant is one of the world's most often used potential therapeutic herbs. This plant is generally used to cure common colds, diarrhea, and fever, as well as jaundice, as a liver and cardiovascular health tonic, and as an antioxidant [24].

*Andrographis paniculata* is an erect herb that grows to a height of 12–43 inches (30–110 cm) in shaded and damp areas all over the world. The plant's stem is thin, dark green, and square in cross-section, with longitudinal furrows and wings in addition to the angles. The medicinal plant's capsule is around 2 cm (0.79 in) long and a few millimeters broad, with lance-shaped leaves up to

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8 cm long. The seeds of this medicinal plant are subquadrate, rugose, and glabrous, and they range in color from yellow to brown. The blooms of this plant bloom from September to December [25]. *Andrographis paniculata* is commonly used for preventing and treating the common cold and fever other use of this plant may include snake and insect bites treatment also can be used to treat loss of appetite, kidney problems as well as hemorrhoids, and the familial Mediterranean fever.



Figure 9: *Andrographis paniculata*

**5.1.6.1 Indications for flu, colds, and respiratory conditions:** This plant is used to treat respiratory problems including the common cold, cough, and influenza, as well as upper respiratory conditions, as well as to relieve cough and sore throat in certain people who have common cold [1]. *Andrographis*, which works like acetaminophen (Tylenol) to lower fever and pain from tonsillitis, can be given by mouth on a daily basis.

**5.1.6.2 Chemical Constituents:** Diterpenoids, flavonoids, and polyphenols are the main components of *Andrographis paniculata*. Trans-cinnamate esters and -sitosteryl fatty acid esters are detected in the roots, monogalactosyl diacylglycerols, lupeol, and triacylglycerols are found in the pods, and neoandrographolide, 1,5-dimethyl-1,5-cyclooctadiene, and 2-hydroxyethyl benzoate are identified in the leaf extracts [26].

**5.1.6.3 Clinical investigation:** The mouse model was used to approve this herbal medication indication for influenza. It also reduces viral loads and has anti-inflammatory and immunomodulatory properties, which help to reduce lung pathology. It's also linked to lymphocyte proliferation, as well as the production of IL-2, which aids in the suppression of tumor cells.

*Andrographis paniculata* has been shown to have a variety of anti-inflammatory actions on a variety of disease targets [1]. After witnessing a clinical experiment, Thai researchers found that chiretta was just as efficient as paracetamol at reducing fever and painful throat in individuals with pharyngeal and tonsillar irritation. Thailand's government approved the use of the southern Asian herb *Andrographis* to treat early symptoms and reduce the severity of COVID-19 [27] in late

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December 2020. According to reviews, this herbal medicine is effective in treating the symptoms of acute respiratory tract infections and reducing the severity of the symptoms. It can also be used in an emergency for cold and flu drugs to alleviate minor COVID symptoms [28].

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**5.1.6.4 Dose:** The dosage is 1–3 g as a decoction, three times a day, and it is taken by adults in doses of 90–600 mg daily for up to 12 weeks, according to the WHO. It can also be used as a combination preparation.

**5.1.6.5 Contradiction, pregnancy/lactation:** Andrographis is likely safe when taken in measured amounts or prescribed doses; but, it has been linked to uncommon and modest adverse effects, including a skin response in a limited number of instances. Furthermore, one of them had nausea and vomiting, but this is an extremely rare occurrence. It may induce delayed blood clotting, which might make bruising and bleeding more likely. It may be dangerous to take by mouth during pregnancy since it might induce miscarriage. There is insufficient data on the safety of Andrographis while breastfeeding.

**5.1.6.6 Overall assessment:** Although Andrographis has many useful properties to treat cold flu and various respiratory condition and it also has been used from ancient times to treat cold but in the case of respiratory condition treatment there is not enough data reported. Although some pieces of evidence show that it has potential use in the relief of early symptoms of COVID-19 and has immunomodulatory activities even the clinical evidence may be considered high but no severe condition is reported, so its safety can be rated as medium.

### 5.1.7 Cinchona officinalis:

*Cinchona officinalis* is a medicinal herb that was one of several Cinchona species used in the production of quinine, a fever-relieving drug. It is particularly beneficial in the prevention and treatment of malaria. Other alkaloids produced by this tree include cinchonine, cinchonidine, and quinidine. Cinchona is commonly used to increase appetite, improve digestion, and relieve bloating, fullness, and other stomach disorders. It's used to treat hemorrhoids, varicose veins, and leg cramps, among other things. In certain people, cinchona is used to treat mild influenza, swine flu, the common cold, malaria, and fever. Other uses include cancer, tongue and throat infections, an enlarged spleen, and muscle cramps. Cinchona plants from the Andean mountain woods have several benefits, one of which is that one of its components contains active compounds that help alleviate fever.

The good influence was initially seen by Jesuit missionaries, and it subsequently spread throughout the world [15]. This medicinal plant is a tree or shrub with hairy branchlets and rugose bark. Stipules are hairless and lanceolate or oblong, with an acute or obtuse angle. Lanceolate to elliptic or ovate leaves, 10 cm long (3.9 in) and 3.5–4 cm (1.4–1.6 in) wide; acute, acuminate, or obtuse tip; rounded to attenuate base; coriaceous, glabrous above and frequently glossy; glabrous underneath or puberulent or short-pilose, especially on veins; coriaceous, glabrous above and frequently glossy; glabrous underneath or Many-flowered panicles with little rough hairs on the hypanthium; the calyx is scarlet, glabrous, or nearly so, with triangular lobes; the corolla is pink or red, sericeous, with elliptical, pointed lobes, and the corolla tube is approximately 1 cm long [28].

Cinchona is often used to dull discomfort, destroy germs, and act as an astringent in eye treatments. Cinchona extraction is also used topically for hemorrhoids, ulcers, hair growth stimulation, and varicose vein management. Cinchona is used in tonic water and alcoholic drinks as a bitter flavoring.

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Figure 10: *Cinchona officinalis*

**5.1.7.1 Indications for flu, colds, and viral infection:** Cinchona is frequently used to treat influenza, swine influenza, cold symptoms, malaria, and pyrexia. Covid-19 pneumonia can also be treated with Cinchona Bark. Quinine sulfate is presently one of the most popular COVID-19 medicines on the market. Public indignation was aroused by improper statements made by state officials and professionals. As a result, people competed to find treatments that included quinine. People's activity was driven by a spontaneous reaction due to the high incidence and death rate of COVID-19 over the world. The capacity of quinine to act as an antiviral medicine, as well as an immunomodulator in a virus-caused sickness, will be discussed in this section. In addition, the potentially harmful effects of quinine in patients with and without COVID-19 will be explored. Quinine became popular because it had a similar effect to the antimalarial drug chloroquine. Malaria drugs were eventually repurposed from antimalarial to strong viral infection inhibitors. Numerous antimalarial drugs have been examined and found to have some advantages against viral infection, according to a large body of data [29].

**5.1.7.2 Chemical Constituents:** Cinchona has an alkaloid as its primary chemical component. There are over 30 distinct types of alkaloids in it. Quinidine, quinine, cinchonine, and cinchonidine are alkaloids found in Cinchona bark. These four bark chemical components are stereoisomers of each other. The alkaloid content of *Cinchona officinalis* is widely recognized. The alkaloids in its bark range from 7 to 12 percent [30].

**5.1.7.3 Clinical investigation:** According to a clinical study, hydroxychloroquine improves the SARS-CoV-2 viral load in COVID-19 patients when combined with azithromycin. Based on these findings, quinine, a chloroquine analog, may be predicted to have beneficial effects in COVID-19 elimination [31]. Furthermore, in their study of quinine sulphate on infected HSV-1 HaCat cells, Baroni et al. discovered that quinine works to limit viral infection through indirect channels such

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as activating the protein heat shock response, interfering with numerous pathways during virus replication, and inhibiting NF- $\kappa$ B by preventing gene expression [32].

Viral RNA is released by infected host cells, interfering with normal protein synthesis. Infected host cell RIG-I expression, on the other hand, rises slightly to boost the IFN-I signaling pathway rather than raising gene expression of IFN-stimulated genes (RNase L, PKR) that restrict protein synthesis and so impede viral replication. The RNase L pathway can eliminate ssRNA in virus-infected cells, but PKR suppresses translation and interferes with signal transmission. The inhibition of genome replication and translation in infected host cells, as well as increased RIG-I and IFN-production, are all targets of quinine action. It has been established that IFN- is the cytokine released by host cells to combat viruses [33].

**5.1.7.4 Dose:** Cinchona dosage is determined by several criteria, including the user's age, health, and a range of other factors. There is presently inadequate scientific information to determine an appropriate dose range for cinchona. Natural products aren't always safe, and the right amounts may make all the difference. Before usage, the pharmacist, physician, or other healthcare specialists should review and follow the prescription as well as the directions on the product label.

**5.1.7.5 The side effect, pregnancy/lactation:** When used as a flavoring in tonic water and alcoholic beverages, Cinchona is most likely safe to ingest. When taken as a medicine, however, it may be hazardous. "Caution - discontinue use if ringing in the ears, deafness, skin rash or vision problems emerge," must be written on all Cinchona over-the-counter (OTC) products. Cinchona contains quinine, which is no longer available over-the-counter in the United States due to serious side effects. Cinchona is exceedingly hazardous and may be lethal in large doses. Cinchona should not be consumed by a woman who is pregnant or breastfeeding. According to several studies, cinchona is harmful to consume when pregnant or nursing.

**5.1.7.6 Overall assessment:** Although its profile matches as safe relief medication for colds and fevers. Cinchona officinalis is also infrequently classified as an immunomodulatory agent. The clinical evidence is insufficient. Although the correct dose must be followed, the safety of this herbal treatment may be regarded as High.

### 5.1.8 *Althaea officinalis*:

*Althaea officinalis*, as well recognized as marshmallow, is a flowering plant native to Europe, Western Asia, and North Africa that has been used in herbal remedies and as a decorative plant. Since Ancient Times, a confection created from the root evolved into today's marshmallow delicacy, although most current marshmallow desserts no longer include any marshmallow root. This has typically been used to heal inflammation of the oral and pharyngeal mucosa, as well as accompanying dry cough, minor gastritis, skin burns, and insect bites [34]. Marshmallow provides a protective coating on the skin and digestive system lining. It also includes compounds that may aid with coughing and wound healing. Marshmallow root is administered to the skin as a component in topical application for dry skin, as well as for discomfort and edema caused by cold contact in the hands and feet. Flowers are employed as an anti-inflammatory, febrifuge, demulcent, and astringent ingredient in decoctions. Ulcers are treated with the roots of this plant. Inflammation of the kidneys and uterus can be treated with flowers as well as roots. Seeds are believed to have diuretic and febrifuge properties [35].



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Figure 11: *Althaea officinalis*

The stems of these herbaceous perennials die down in the autumn. They normally grow 90 to 120 cm (3 to 4 feet), although they can grow up to 2.0 m and only produce a few lateral branches. The leaves are petioled, roundish, ovate-cordate, 50 to 75 mm (2 to 3 in) long, 30 mm wide, whole or three to five-lobed, irregularly toothed at the edge, and thick. Due to a rich coating of stellate hairs, they are soft and velvety on both sides. The light purple resembles those of the common mallow, but they are smaller and lighter in color, and they grow in axillary or panicle formations, with the latter being more common.

**5.1.8.1 Indications of respiratory problems, cold, and cough:** *Althaea Officinalis* is used to treat coughs that are dry and unpleasant, as well as irritations of the oral and pharyngeal mucosa. Cough, sore throat, and other respiratory diseases may benefit from the use of *A. officinalis* in conjunction with other plant extracts in various forms of medicine [1]. ACE inhibitors, which are used to treat high blood pressure, might produce coughing as a side effect. According to preliminary studies, consuming marshmallow root by mouth for four weeks can help to minimize cough produced by ACE inhibitors. Captopril, enalapril, and lisinopril are examples of ACE inhibitors.

**5.1.8.2 Chemical Constituents:** Pectins 11%, starch 25-35%, mono- and di-saccharide saccharose 10%, uucilage 5%, flavonoids (Hypolaetin- 8 glucosideisoquercitrin, kaempferol, caffeic, pcoumaric acid), coumarins, scopoletin, phytosterols, tannins, asparagine, and numerous amino acids were among the substances isolated from different parts of *Althaea Officinalis* [34].

**5.1.8.3 Clinical investigation:** This plant remedy has been shown to be effective in treating the symptoms of a respiratory condition, specifically cough. Marshmallow root aqueous extract

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suppressed tracheobronchial smooth muscle contractions in rats in a dose-dependent manner. The polysaccharide reduced the number of coughing attempts, cough frequency, and cough severity in the tracheobronchial regions substantially [36]. The effectiveness, tolerability, and comfort of *A. officinalis* root aqueous extract in the form of lozenges and syrup were examined in a clinical study on 822 patients with dry cough and pharyngeal discomfort. The decoction of *Althaea officinalis* root relieved the symptoms of dry cough in less than 10 minutes and was well tolerated. In the syrup group, there were just three mild side effects [1].

**5.1.8.4 Dose:** On the basis of traditional use, 3 times a day, 0.5–5.0 g in 150 ml of water as a macerate. In a daily dosage of 2.0-8.0 ml, marshmallow root syrup is also a regularly used preparation.

**5.1.8.5 The side effect, precautions, and pregnancy/lactation:** When it is used appropriately, marshmallow root is unlikely to create negative effects. Individuals have a very minimal chance of harmful effects, according to most studies. Individuals may, however, be allergic to marshmallow root in rare circumstances. A tiny quantity of marshmallow root can be applied to the skin inside the elbow to check for a skin allergy. It should be okay to use somewhere else on the epidermis if no reaction occurs within 24 hours. There just isn't enough trustworthy evidence to determine whether marshmallow is safe to use while pregnant or nursing. Marshmallow has the potential to influence blood sugar levels. It may mess with blood sugar regulation during and after surgical operations. As a result, it's best to avoid marshmallows for at least two weeks before a scheduled operation.

**5.1.8.6 Overall assessment:** Through anti-inflammatory and relaxing actions on the respiratory system, *Althaea officinalis* formulations can reduce cough and reduce discomfort. Although the evidence for its conventional use as cold treatment in the context of upper respiratory illnesses is lacking, the evidence allows us to infer a possible application in the alleviation of COVID-19's early symptoms. The clinical data is strong, and there have been no serious adverse effects documented with this herbal treatment, thus it has a high safety rating.

### 5.1.9 *Zingiber officinale*:

*Zingiber officinale* is a flowering plant whose rhizome, often known as ginger root or ginger, is extensively seen as a spice and folk medicine. It's an herbaceous perennial with one-meter-tall yearly pseudostems (false stems consisting of curled leaf bases) bearing thin leaf blades. Flowers with pale yellow petals and purple borders bloom on individual branches that emerge straight from the rhizome [37]. Ginger has 49 genera and 1300 species and is endemic to East and Southern Asia. In Sanskrit, the plant is known as Sringavera. It is an essential medicinal plant that grows wild in countries such as India, China, Southeast Asia, the West Indies, Mexico, and other regions of the world. Since ancient times, this natural gold has been used as a spice and flavoring ingredient throughout the world [38].

This plant is an upright perennial that grows to a height of one to three feet. The sheathing bases of the two-ranked leaves encircle the stem. The bracts under a club-like spike of golden, purple-tipped blooms are a brilliant greenish-yellow. Regrettably, ginger seldom blooms in the garden. The wide scaly rhizomes (underground stems) of the plant are used to make commercial ginger. Numerous portions of the rhizome are known as "hands" because they branch with thick thumb-like protrusions. Rhizomes are 7-15 cm long, 1-1.5 cm wide, and compressed laterally. The slant-arising branches are around 1-3 cm long and terminate with depressed scars or underdeveloped buds [38]. Ginger is a highly popular spice that is used all over the world; either it can be used to flavor food or as a medication. The desire for ginger has remained stable throughout history.



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Ginger may be found in vegetables, sweets, soda, pickles, and alcoholic drinks, among other foods and medicines.



Figure 12: *Zingiber officinale*

**5.1.9.1 Indications for respiratory conditions:** The herb *Zingiber officinale* is used to treat colds and coughs. It has also been used as an anti-asthma and expectorant. According to both Ayurveda and contemporary conceptions, ginger is beneficial in viral infections and reviving the body in illness situations by stimulating hunger, immunity, and re-boosting depleted physiological processes in the human body. In Ayurveda literature, ginger is typically used to treat colds. It also acts as an antipyretic asthmatic relief. Cough relief [39].

**5.1.9.2 Chemical Constituents:** Components of active constituents ginger has a lot of active ingredients like phenolics and terpene chemicals. Ginger's phenolic constituents include gingerols, shogaols, and paradols. Gingerols, such as 6-gingerol, 8-gingerol, and 10-gingerol, are the most abundant polyphenols in fresh ginger.

**5.1.9.3 Clinical Investigation:** This plant remedy is effective in treating fever in studies. Its anti-inflammatory, anti-pyretic, and analgesic activities have been shown in various preclinical investigations. Ginger's anti-inflammatory properties have been proven in both in vivo and in vitro studies. 6-Shogaol suppresses COX and prostaglandin release while interfering with the inflammation response. In addition, 6-gingerol and 6-shogaol have anti-platelet aggregation properties in vitro [1]. In Ayurvedic literature, a nasal rinse made from *Citrus medica* and *Zingiber officinale* is indicated for the treatment of infectious fevers. These plants have also been linked to the treatment of respiratory disorders and been linked to antimicrobial activity in other literature. SARS-CoV-2 proteins, which are required for the virus's entrance into human cells and are

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abundant in the goblet and ciliated cells of the nasal epithelium, play a key role in the virus's infectiousness. Docking experiments revealed that the chemicals found in *Z. officinale* had a strong affinity in silico for the virus's spike protein and the ACE-2 receptor in the host.

**5.1.9.4 Dose:** Ginger is often used in dishes and drinks as a flavor. Ginger is accessible in a variety of forms as medication, including teas, syrups, pills, and liquid extracts. Adults are the ones who utilize ginger the most. 3–4 times daily by orally for up to 12 weeks, 1 g dry rhizoma in 150 ml.

**5.1.9.5 The side effect, precautions, and pregnancy/lactation:** Heartburn, diarrhea, burping, and overall stomach pain are all possible adverse effects. The danger of adverse effects rises when individuals take greater amounts of 5 grams per day. When used by mouth as medication during pregnancy, it may be safe. Some specialists advise against using it close to the due date since it may raise the chance of bleeding. When taken with this medicine, aspirin may increase the chance of bleeding, but it appears to be safe to use for morning sickness without harming the baby. There isn't enough credible evidence to say if ingesting bigger doses of ginger during lactating is safe. It also has antiplatelet activity.

**5.1.9.6 Overall Assessment:** In the context of respiratory diseases, the composition and chemistry of *Zingiber officinale* fit as an anti-inflammatory medication. As a result of its anti-inflammatory properties, this herbal medication may be effective in the treatment of respiratory ailments. The clinical evidence is of moderate quality. This herbal remedy is regarded as having a Medium level of safety.

### 5.1.10 *Cymbopogon citratus*:

The tropical plant *Cymbopogon citratus*, sometimes known as West Indian lemongrass or just lemongrass, is native to Maritime Southeast Asia and has been imported to many tropical areas. Lemongrass (*Cymbopogon citratus*) is the grass that thrives in hot climates. Lemongrass (*Cymbopogon citratus*) is a perennial tropical grass with narrow, long leaves that is one of Algeria's most important medicinal and fragrant plants. It is also grown in tropical and subtropical parts of Asia, South America, and Africa for its essential oil (EO) [41]. Lemongrass comes in over 140 varieties and may be found in various countries of Africa and Asia. It's frequently used in Asian cuisine as a flavoring element, in fragrance, and as an insect repellent. Lemongrass has also been used in folk medicine to alleviate anxiety, gastrointestinal issues, and to help people fall asleep. The majority of these effects have been demonstrated in animal research. Lemongrass has been shown in lab experiments to have anti-inflammatory, antioxidant, and anti-cancer qualities, as well as lowering blood pressure.

*Cymbopogon citratus* belongs to the Poaceae family of grasses. Simple, bluish-green leaves with complete edges and a linear form are present. The blades are usually 18–36 inches in length. The leaves, like those of other grasses, have parallel venation [42].

**5.1.10.1 Indications for respiratory conditions:** Lemongrass is used to treat symptoms of respiratory illness as well as fever. Recipes made from this plant, alone or in conjunction with other medicinal plants, have been shown to be effective against a variety of viruses that cause respiratory illnesses.

**5.1.10.2 Chemical Constituents:** In addition to myrcene, citronellal, citronellol, linalool, and geraniol, lemon grass oil includes 65–85 percent citral. Terpenes, alcohols, ketones, aldehydes, and esters are the most common chemicals found in *Cymbopogon citratus*. Essential oils including Citral, Citral, Nerol Geraniol, Citronellal, Terpinolene, Geranyl acetate, Myrcene, and Terpinol Methylheptenone are among the phytoconstituents documented. Geraniol (41.3%), neral (32.3%),

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and myrcene (15.5%) were the significant constituents in the EO from Burkina Faso, whereas geranial (44.6%), neral (33.3%), and myrcene (15.5%) were the major constituents in the EO from Burkina Faso (10.7 percent) [43].



Figure 13: *Cymbopogon citratus*

**5.1.10.3 Clinical Investigation:** The fever-fighting properties of *Cymbopogon citratus* have been studied in the lab. The antipyretic efficacy of *C. citratus* herbal tea was tested in rats (p.o. or i.p.) but no drop in body temperature was observed. Other associated experimental results, on the other hand, include the anti-inflammatory capability of this plant, particularly the essential oil. The essential oil of *C. citratus* has been shown to reduce TNF-induced neutrophil adhesion, inducible nitric oxide synthase (iNOS), and other LPS-induced pathways, as well as decrease COX-2 and peroxisome proliferator-activated receptor alpha (PPAR-) signaling. For respiratory disorders, this herbal remedy has not been scientifically tested. Overall, clinical data is insufficient [1].

**5.1.10.4 Dose:** The right amount of lemongrass to take depends on a variety of factors, including the user's age, health, and other circumstances. There is currently insufficient scientific evidence to define a suitable dosage range for lemongrass. Posology is a term that refers to the (based on traditional uses). 1–2 g dried leaves (or 4–5 g fresh leaves) in 150 ml three times each day.

**5.1.10.5 The side effect, precautions, and pregnancy/lactation:** When consumed by mouth, applied to the skin, or breathed as aromatherapy for therapeutic purposes, it is safe. When applied to the skin, lemongrass oil can create a rash of skin irritation. Taking lemongrass by mouth during pregnancy is probably not a good idea. Lemongrass appears to be able to initiate menstrual flow, which raises the possibility of a miscarriage.

**5.1.10.6 Overall Assessment:** Even though the anti-inflammatory activity of *C. citratus* preparations on the respiratory tract may be effective in the symptomatic relief of respiratory

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illness, its profile does not suit as a safety relief treatment for flu. The clinical evidence may be deemed insufficient. This herbal medicine's safety may be classified as High because no serious issues have been documented.

### 5.1.11 *Foeniculum vulgare*:

Fennel is a plant that originated in the southern Mediterranean region and now grows wild throughout the Northern, Eastern, and Western hemispheres, notably in Asia, North America, and Europe, thanks to naturalization and cultivation. The perennial plant fennel (*Foeniculum vulgare*) is farmed for its tasty shoots, leaves, and seeds. The bulblike stem base of Florence fennel (variety *azoricum*) and also the blanched shoots are consumed as a vegetable, while all sections of the plant are fragrant and used in flavoring.

Fennel, or *Foeniculum vulgare*, is a very valuable therapeutic and fragrant herb that is extensively used as a carminative, digestive, galactagogue, and diuretic, Antimicrobial, antiviral, anti-inflammatory, antimutagenic, antinociceptive, antipyretic, antithrombotic, antithrombotic, apoptotic, as well as in the treatment of respiratory and gastrointestinal diseases [44].



Figure 14: *Foeniculum vulgare*

*F. vulgare* is a perennial plant with delicate, feathery, almost hair-like leaves that grow up to 6.6 feet (2 meters) tall. This plant has a dill-like appearance. Its anise-flavored leaves and seeds are commonly planted in vegetable and herb gardens. It's upright and cylindrical, brilliant green and shiny, with several branching leaves split into the tiniest of pieces. The leaves may grow up to 40



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cm long and are finely divided, having filiform (threadlike) final segments that are around 0.5 mm broad. In July and August, the bright golden blooms with thirteen to twenty rays bloom in big, flat terminal umbels [45].

**5.1.11.1 Indications for cold, flu respiratory conditions:** In this COVID19 age, fennel tea has become popular due to its remarkable health benefits in treating coughs and colds at the same time, increasing immunity, and protecting against allergies and infections. Fennel tea is an excellent cold, cough, and flu cure because it is high in antioxidants and vitamin C, which help to fight infections and the seasonal cold. Furthermore, fennel seeds are high in anti-inflammatory essential oil and phytonutrients, which aid in the prevention and treatment of nasal congestion and colds [46].

**5.1.11.2 Chemical Constituents:** Trans anethole (69.87 percent), fenchone (10.23 percent), estragole (5.45 percent), and limonene were among the 23 chemicals found in fennel essential oil (5.10 percent). Total phenolic content (627.21–967.50 GAE, mg/100 g) and total flavonoid content (374.88–681.96 CE, mg/100 g) were both high in fennel seed extracts [46].

**5.1.11.3 Clinical Investigation:** This herbal remedy has been shown to be effective in the treatment of cough in studies. In rats, the ethanol extract and essential oil of *F. vulgare* showed analgesic and anti-inflammatory effects. Using isolated guinea-pig trachea as a model for bronchodilatory action, the myorelaxant activity of the aqueous and ethanolic extract and essential oil of *F. vulgare* was assessed. Theophylline-like relaxing effects are produced by ethanolic extract and essential oil. The aqueous extract, on the other hand, caused the muscles to constrict. *Foeniculum vulgare* has never been tested in a clinical setting for respiratory problems. Overall, clinical evidence is weak [1].

**5.1.11.4 Dose:** A 1-cup (87-gram) meal of raw fennel bulb has 3 grams of fiber or 1.5 to 2.5 g in 200 ml boiling water (brew for 15 minutes) three times a day.

**5.1.11.5 The side effect, precautions, and pregnancy/lactation:** Sun poisoning, skin responses, and cross-reactivity are all possible side effects of fennel. Fennel can cause allergic skin reactions in certain people. People who are allergic to celery, carrots, or mugwort are more likely to be allergic to fennel as well. The oil has the potential to produce hallucinations and convulsions. The usage of fennel has been linked to premature breast growth in girls. Estragole, a component of the volatile oil, has been found in animals to induce tumors. There isn't enough information on the safety of fennel use during pregnancy. It's better to stay away from it. Fennel may be harmful to a nursing mother.

**5.1.11.6 Overall Assessment:** Despite the fact that it matches the characteristics of a cough reliever in the setting of upper respiratory infections, therapeutic benefits are likely to be limited. The clinical evidence is insufficient. There have been no clinical reports of fennel poisoning. Although the specified dosage must be followed, this herbal medicine's safety may be classified as High.

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### 5.1.12 *Eucalyptus globulus*:

*Eucalyptus globulus*, often known as blue gum or southern blue gum, is a tall, evergreen tree found exclusively in southeastern Australia. This eucalyptus is one of the finest for pulp production. Carpentry, building, fences, piles, platforms, plywood, poles, shelters, and stations, tool handles, veneer, and other uses for wood. Essential oil is antibacterial, rubefacient, and stimulant, and is extensively used in cough drops. A form of kino derived from an Argentine tree. Pinenes are utilized in synthetic camphor, pine oil, terpineol, dry cleaning fluids, solvents, and low-cost deodorants, and the *Eucalyptus* hybrid 'Mysore' is a potential source of pinenes. Antibiotic activity has been demonstrated in the leaves. [47].



Figure 15: *Eucalyptus globulus*

*Eucalyptus globulus* Labill is a fragrant tree in the Myrtle Family (Myrtaceae) that grows to be 150-180 feet tall and 4-7 feet in diameter. It has a well-developed crown and a straight trunk that extends up to two-thirds of its whole height. Many lateral branches and roots skirt the core trunk and taproot. The taproot seldom grows longer than 10 feet. The bark is pale yellow-brown and deciduous. Older branches have short lanceolate leaves that are typically curled, alternating, and hanging vertically. They have a lustrous, dark green appearance and are thick and leathery. They are 1.5-2 dm in length on average. Young branches have oval, opposite, sessile, and horizontal leaves. They have a grayish, waxy bloom on the bottom surface of the leaf that is significantly thicker. Young stems have a squared or winged appearance. Solitary white blooms on flattened stalks bloom in the axils. They measure about 4-5.5 centimeters in width. A warty lid formed by the sepals and petals is present on the bud and slips off at anthesis. The flower contains a large

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number of stamens. The ovary has four locules and several ovules. From December through May, flowers are at their peak. The fruit is a firm, woody capsule with a large flat disc and a broad top shape or globose form. It has four loculicidal dehiscent valves at the top. The fruit is 2-2.5 centimeters in diameter. The seeds are around 2 by 1 mm in size [48].

**5.1.12.1 Indications for cold, flu respiratory conditions:** *Eucalyptus globulus* is used to treat respiratory problems such as cough. Because of the presence of 1-8-cineol, it can also be used as a respiratory antiseptic. Cough lozenges and inhalants, for example, include eucalyptus, which is used to treat the symptoms of the common cold. To alleviate a sore throat, sinusitis, or bronchitis, herbal medicines advocate gargling with fresh leaves. Inhaled eucalyptus oil vapor also looks like it might be a decongestant. Eucalyptus is used to treat a variety of ailments, including asthma, bronchitis, flu (influenza), and many more [49].

**5.1.12.2 Chemical Constituents:** The total lignin content (which includes acetone extractives, water-soluble material, Klason lignin, acid-soluble lignin, crystalline cellulose, amorphous glucan, xylan, arabinan, galactan, mannan, rhamnan, fucan, total uronic acids, and ash) (Klason lignin plus acid-soluble lignin). The largest concentration of crystalline cellulose is found here (37 percent). The plant's component also contains amorphous glucan and uronic acid [50].

**5.1.12.3 Clinical Investigation:** Herbal steam inhalation treatment is a well-known home cure for common colds in Indian traditional knowledge systems. The many herbs used in traditional in-home inhalation treatment provide a wide variety of medical advantages that have been demonstrated to boost the respiratory and immune systems. The globules of *Eucalyptus* were used in this investigation. These plants' phytochemical contents have been extensively researched and recorded in the treatment of colds and respiratory conditions [51]. This herbal remedy has not been scientifically shown to help with respiratory issues. Studies with leaf extracts, essential oil, and 1,8-cineol in vitro and in vivo suggest some ethnomedicinal usage. Clinical trials of *Eucalyptus globulus* essential oil formulations for respiratory disorders have been conducted (bronchitis, rhinitis) [52].

**5.1.12.4 Dose:** 1.5–3 g of dried leaves in 150 ml, four times a day. And if one is suffering from nasal congestion, then 1 teaspoon of boiling water, rubbed on the chest and around the nose for steam inhalation.

**5.1.12.5 The side effect, precautions, and pregnancy/lactation:** Allergic responses, abdominal discomfort, the blue coloring of the skin, shortness of breath, coordination problems, low blood pressure (hypotension), irregular heartbeats (arrhythmias), and multi-organ failure are some of the side effects. *Eucalyptus* is commonly used as a flavor in little amounts in dishes. However, there isn't enough credible data to say if eucalyptus oil is safe to take while pregnant or breastfeeding. In excessive amounts, eucalyptus oil, like many other essential oils, has been linked to mortality due to digestive inflammation [47].

**5.1.12.6 Overall Assessment:** *Eucalyptus globulus* has a relaxing impact on the respiratory system, which may help to relieve symptoms associated with upper respiratory infections. Despite the widespread usage of products containing eucalyptus derivatives, further research on the influence on the respiratory system is needed. The clinical evidence is of medium quality. Despite worries regarding eucalyptus usage by children, this herbal remedy is considered to be harmless.

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### 5.1.13 *Thymus vulgaris*:

*Thymus vulgaris* is a Mediterranean evergreen plant endemic to southern Europe. Since olden history, the herb has been used as a culinary component to flavor cheeses. The Mediterranean and adjacent nations, Northern Africa, and portions of Asia are home to the plant. The plant has been grown in Egypt, Morocco, Algeria, Tunisia, and Libya. *T. Vulgaris* is a popular herbal remedy that has been used to cure alopecia, dental plaque, dermatophyte infections, bronchitis, cough, inflammatory skin problems, and gastrointestinal discomfort for thousands of years. Astringent, anthelmintic, carminative, disinfectant and tonic have all been suggested for this herb [53].

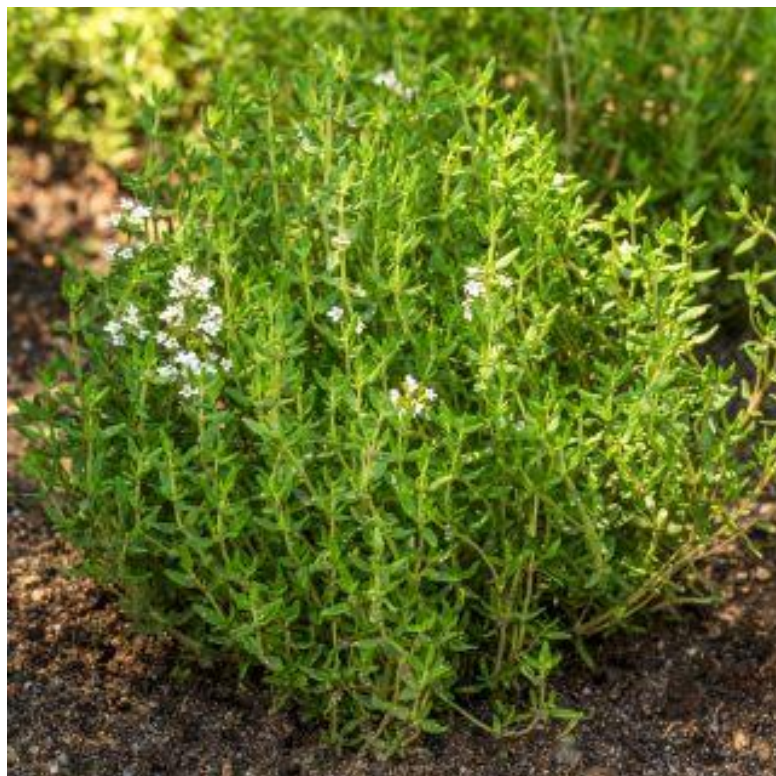


Figure 16: *Thymus vulgaris*

Thyme is a small perennial shrub with a semi-evergreen groundcover that seldom grows taller than 40 cm. It has both horizontal and upright growth patterns. With time, the stems turn woody. Thyme leaves are relatively small, measuring 2.5 to 5 mm in length, and vary greatly in shape and hair covering depending on the variety, with each species having a distinct aroma. *T. Vulgaris* leaves are oval to rectangular in shape, with some fleshy aerial components that are employed in the synthesis of volatile oils, mostly by steam distillation. Thyme thrives in a warm to the hot, dry, sunny environment and in areas where the plants don't appear to be shadowed [54].

**5.1.13.1 Indication for Respiratory conditions, cold, flu:** *Thymus vulgaris* has attracted a lot of interest because of its antiviral qualities, which can complement and, in some circumstances, replace conventional medications. TEO from *Thymus vulgaris* has previously been demonstrated to be effective against a variety of RNA viruses, including CoVs [55].



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*Thymus vulgaris* is used to treat coughing that is caused by a cold, laryngitis, or tonsillitis. *Thymus vulgaris* has been used for healing, curing chest congestion, and inducing saliva since ancient times; the fresh leaves are used to treat sore throats. The herb is also used to cure worms in children as well as treat chest infections (bronchitis, pharyngitis, whooping cough) [56].

**5.1.13.2 Chemical Constituents:** T. Vulgaris essential oil has a high concentration of oxygenated monoterpenes (56.53%) and low concentrations of monoterpene hydrocarbons (28.69%), sesquiterpene hydrocarbons (5.04%), and oxygenated sesquiterpenes (5.04%). (1.84 percent) Thymol (51.34 percent) was the most abundant compound among the essential oil components, with all other components accounting for less than 19 percent [54].

**5.1.13.3 Clinical Investigation:** SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) is a global pandemic illness. Although there is no effective treatment for this virus at this time, several herbs can help to alleviate its symptoms. According to certain sources, *Thymus vulgaris* has high antioxidant components that help to improve the immune system and has antiviral properties that help to relieve respiratory problems. As a result, researchers hypothesized that T.vulgaris may help patients with coronavirus illness 2019 alleviate some of their symptoms (COVID-19) [57].

T. Vulgaris essential oil was tested in rats using traditional procedures, and it was discovered to have anti-inflammatory properties. Additional investigations revealed that carvacrol, which has anti-edematogenic and anti-chemotactic properties, plays a key part in the activity. In vitro investigations confirmed the suppression of chemotaxis. Thymol, on the other hand, acted as an irritant by promoting the release of histamine. Ex vivo, the hydroethanolic extract of T. vulgaris has myorelaxant action [1].

**5.1.13.4 Dose:** Although the optimum amount of thyme varies on a variety of criteria such as the user's age, health, and other circumstances, a basic rule of thumb is to take 1–2 g of dried leaves in 150 ml of water 3–4 times per day as an infusion.

**5.1.13.5 The side effect, precautions, and pregnancy/lactation:** When taken by mouth as medication for a short length of time, thyme may be considered safe. It might cause intestinal problems, headaches, and dizziness in some people. There isn't enough credible evidence to determine whether or not thyme oil is safe to use as a medicine or what the potential adverse effects are. When ingested in typical meal amounts, thyme is probably safe for pregnant and breastfeeding women. There isn't enough trustworthy data to say whether or not thyme can be used in greater medical doses. To be safe, limit yourself to the levels found naturally in foods. Thyme may cause allergic reactions in those who are sensitive to oregano or other Lamiaceae species.

**5.1.13.6 Overall Assessment:** Although T. Vulgaris has not been scientifically demonstrated to give symptomatic alleviation of flu symptoms, its spasmolytic and anti-inflammatory properties may make it effective in the treatment of respiratory symptoms. The clinical evidence is insufficient. This herbal remedy is thought to be quite safe.

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### 5.1.14 *Nigella sativa*:

Black cumin (*Nigella sativa*), often known as black seed, is a spice and herbal medicine plant. The black cumin plant is native to southern Asia, the Mediterranean, and portions of Africa, where it has a long history of culinary and medicinal usage. The seeds have a fennel-like scent and a strong flavor comparable to nutmeg, despite the fact that the plant is unrelated to either. In India, the Middle East, and portions of North Africa, the seeds are often roasted and crushed as a spice.

Black seed has traditionally been used to treat headaches, toothaches, nasal congestion, and intestinal worms. It's also been used to treat conjunctivitis (pink eye), abscesses (pockets of infection), and parasites. Black seed is now utilized to treat gastrointestinal issues such as gas, colic, diarrhea, dysentery, constipation, and hemorrhoids. Asthma, allergies, cough, bronchitis, emphysema, flu, swine flu, and congestion are among the respiratory disorders for which it is prescribed. The seeds' crude extracts (and some of their active ingredients, such as volatile oil and thymoquinone) have been shown to protect against nephrotoxicity and hepatotoxicity caused by illness or pollutants. Anti-inflammatory, analgesic, antipyretic, antibacterial, and anticancer properties are all present in the seeds/oil. The oil lowers blood pressure while also increasing breathing [58].



Figure 17: *Nigella sativa*

The species is a tall annual plant with a mature height of 30.0 cm to 67.6 cm. Leaf arrangement alternates, leaf phylotaxy 1-2, pinnae of leaves wide, number of pinna per rachis 5-6; total branches per plant ranges from 4 to 10 [59].

The blooms are tiny, generally pale blue and white, and have five to ten petals. Black cumin plants are hardy annuals. Five petals, many stamens, and five or six elongated conjoined carpels make up

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the pale blue or white blooms. The black triangular or pyramidal seeds are enclosed in a capsule with five or six segments, each ending in an extended protrusion.

**5.1.14.1 Indication for Respiratory conditions, cold, flu:** According to research, ingesting black seed oil by mouth regularly may help people with hay fever symptoms. Coughing, wheezing, and lung function in certain asthmatics can be improved by taking black seed by mouth along with asthma medications. However, it appears to operate primarily in those who had extremely limited lung function before therapy. It also doesn't appear to operate as effectively as theophylline or salbutamol. A lung illness that makes breathing difficult (chronic obstructive pulmonary disease or COPD). According to research, ingesting a particular black seed oil can assist persons with COPD who are also using prescription inhalers improve their lung function [60].

**5.1.14.2 Chemical Constituents :** *N. sativa* seeds constituents are fixed oil – 32 to 40% (saturated fatty acids- about 30%; palmitic acid, stearic and myristic acid; unsaturated fatty acids: arachidonic, eicosadienoic – 3%, linoleic – 50 to 60%; oleic acid – 20%; dihomolinoleic fatty acids – 10%), volatile oil- 0.4 to 0.45% (nigellone, thymoquinone, thymohydroquinone, dithymoquinone, thymol, carvacrol,  $\beta$  and  $\gamma$ -pinene, dlimonene, d-citronellol, p-cymene), proteins 16- 19.9% (arginine, glutamic acid, leucine, lysine, methionine, tyrosine, proline, threonine), minerals 1.79-3.74% (calcium, phosphorus, potassium, sodium, iron), carbohydrate 33.9%, fiber 5.50%, and water 6.0% [59].

**5.1.14.3 Clinical Investigation:** *Nigella sativa* (black cumin seeds) was studied for its potential to treat COVID-19 patients, as in vitro and in vivo experiments confirmed that *N. sativa* has antiviral, antioxidant, anti-inflammatory, immunomodulatory, bronchodilatory, antihistaminic, antitussive activities related to the causative organism and symptoms and signs of COVID-19. To treat COVID-19 patients, *N. Sativa* might be utilized as an adjuvant therapy with repurposed conventional medications [61]. A few modest trials show clinical advantages in asthma patients. In a randomized, double-blind, placebo-controlled experiment, soft gel capsules of cold-pressed *N. Sativa* oil (0.7 percent thymoquinone) supplemented with conventional medication improved asthma management with a trend in pulmonary function improvement.

**5.1.14.4 Dose:** The optimal dose of black seed is determined by numerous factors, including the user's age, health, and other circumstances. For fever, 0.5 mL of black seed oil or 40-80 mg/kg daily for 4-8 weeks has been utilized. For 12 weeks, 2 g k seed was taken daily to treat asthma. In addition, 500 mg of black seed oil was given twice daily for four weeks. In addition, for three months, 15 mL/kg of black seed extract was utilized every day. A single 50-100 mg/kg dosage has also been utilized. For a lung illness, 2 grams of black seed oil daily for 3 months was administered.

**5.1.14.5 The side effect, precautions, and pregnancy/lactation:** When applied to the skin, black seeds can produce allergic reactions. In dietary quantities, the black seed appears to be safe during pregnancy. However, ingesting bigger levels found in medication is likely to be dangerous. Black seed has the ability to halt or stop the contraction of the uterus. There is insufficient trustworthy evidence to determine if black seed is safe to use while breastfeeding. Black seed has the potential to decrease blood coagulation and raise the risk of bleeding. In rare cases, black seed might aggravate bleeding issues.

**5.1.14.6 Overall Assessment:** Black seed may help to relieve respiratory symptoms, particularly those related to a severe cough, as well as lower inflammatory parameters. The clinical data, which focuses on asthma, is quite limited. In this scenario, the numerous well-intentioned but low-quality studies, as well as the vast variety of assertions they attempt to support, make any judgment

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difficult. The clinical evidence is of moderate quality. This herbal remedy is thought to be quite safe.

### 5.1.15 *Silybum marianum*:

Milk thistle (silymarin) is a blooming plant that is related to daisies and ragweed. It is indigenous to the Mediterranean region. Some people also call it Mary thistle and holy thistle. *Silybum marianum* is a medicinal plant used for silymarin production in central Europe and Asia. It is also regarded as a weed in both arable and grazing regions. Despite the fact that *S. marianum* still has wild-type characteristics, its fruit and biomass yield is exceptional. As a result, the species is gaining popularity as a possible new commercial crop with many applications (i.e. medicinal plant, bioenergy, and vegetable oil production) [62].

*Silybum marianum*, with its antioxidant activity and other liver-protective qualities, is a unique hepatoprotective agent in several experimental and clinical trials. Silymarin is the primary component of *Silybum marianum*, and it has been shown to have significant hepatoprotective properties. It's been used to treat a variety of liver problems, including functional impairment and degenerative necrosis. Although its exact methods of action are unknown, it appears to have a variety of effects, including antioxidant and anti-inflammatory properties. *Silybum marianum* is a biennial plant with straight stems that is glabrous, light green, and spinescent. This plant has large leaves with white dots along the veins. As a triangular-ovary component, it has numerous pinnate elements. It has simple, thinly branching, or thickly branched branches that culminate in a green mass with longitudinal rakes. It may reach a height of 200 cm, with a cottony stem that has a conical form. The stem is hollow and the leaves are oblong to lanceolate. The leaves of *Silybum marianum* are lobate or pinnate, with spiky edges and hairless, glossy green veins. This plant's flower heads are up to 12 cm long and broad, with a red-purple color [63].



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Figure 18: *Silybum marianum*

**5.1.15.1 Indication for Respiratory conditions, cold, flu:** *Silybum marianum* is used to treat the symptoms of respiratory illness, such as fever and catarrh (excessive mucus discharge or build-up in the nose or throat) caused by mucous membrane irritation [64].

**5.1.15.2 Chemical Constituents:** The seeds of the milk thistle, which contain about 4–6% silymarin, are used to make traditional milk thistle extract. About 65–80 percent silymarin (a flavonolignan complex) and 20–35 percent fatty acids, including linoleic acid, make up the extract. Silymarin is a complex mixture of polyphenolic molecules that includes seven closely related flavonolignans (silybin A, silybin B, isosilybin A, isosilybin B, silychristin, isosilychristin, silydianin) and one flavonoid (silybin A, silybin B, isosilybin A, isosilybin B, silychristin, isosilychristin, silydianin (taxifolin). Silibinin, a semipurified fraction of silymarin, is predominantly composed of a 1:1 combination of two diastereoisomers, silybin A and silybin B [65].

**5.1.15.3 Clinical Investigation:** The medicine is well-known for its safety, and it is commonly used in the region to treat liver problems. As a result, the goal of the study was to see if silymarin (a chemical related to Silibinin that is present in the region) may help improve the outcome of liver disease and COVID-19, respectively. Inflammatory cell infiltration in the respiratory tract was shown to be reduced, inflammation and fibrosis were alleviated, and survival was increased when silibinin was used. In the clinical scenario of severe COVID-19, silibinin may be predicted to phenotypically combine the modes of action of IL-6-targeted monoclonal antibodies and pan-JAK1/2 inhibitors to minimize the cytokine storm and T-cell lymphopenia. Silibinin, a remdesivir-like inhibitor of RNA-dependent RNA polymerase (RdRp), the primary component of SARS-

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replication/transcription CoV-2's mechanism, is likely to lower viral load and hamper delayed interferon responses, according to computational predictions [66].

**5.1.15.4 Dose:** It is best to use a commercial formulation with known composition and an acceptable dosage. Though 210-600 mg has been administered daily for up to 6 months in most cases, for 4 months to a year, 200 mg of milk thistle extract was administered once or three times daily.

**5.1.15.5 The side effect, precautions, and pregnancy/lactation:** Even when used for several years, milk thistle appears to have few adverse effects. Nausea, diarrhea, itching, and bloating are among the symptoms that some people experience. It has the potential to interact with a variety of medications, including those used to treat excessive cholesterol, infections, sleeplessness, and blood pressure.

Because milk thistle can reduce blood sugar, patients with diabetes should see their doctor before using it, as it might cause their blood sugar to drop dangerously low. There isn't enough reliable evidence to say whether milk thistle is safe to use while pregnant and lactating women. As a result, individuals should be cautious and avoid using it.

**5.1.15.6 Overall Assessment:** Although *S. marianum* has not been clinically demonstrated to give symptomatic alleviation of flu symptoms, it may be beneficial in the treatment of respiratory symptoms due to its anti-inflammatory properties. The clinical evidence is insufficient. This herbal remedy is thought to be quite safe.

## 5.2 Findings:

According to WHO, in the United States, 20% of individuals utilize herbal products and medications. Furthermore, herbal medications are used by 40% of the population in China, 70% of the population in Chile, and 40% of the population in Colombia. For primary therapy, 48 percent of the population in Australia, 70 percent in Canada, 38 percent in Belgium, 70 percent in India, 80 percent in Bangladesh, and 75 percent in France rely on herbal medications.

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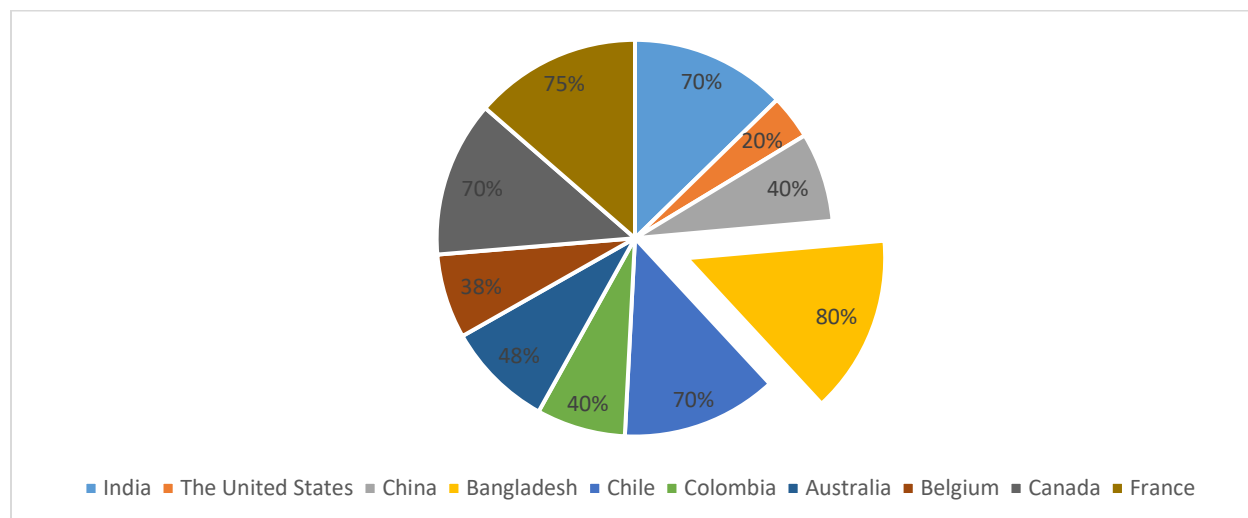


Figure 19: Percentages of people in different countries rely on herbal medicine for primary treatment.

Below is a summary of the chemical composition of herbs, as well as their indications and safety margins, which are used in the treatment of COVID-19. Following the study, because of their reasonable safety margins and emerging evidence for efficacy in the treatment of mild common flu and mild respiratory conditions, herbal medicines like *Withania somnifera*, *Ocimum gratissimum*, *Cinchona officinalis*, *Curcuma longa*, *Althaea officinalis*, *Cymbopogon citratus*, *Foeniculum vulgare*, *Thymus vulgaris*, *Nigella sativa*, and *Silybum marianum* should be considered promising candidates.

Herbal product Name	Chemical Constituent	Use in COVID-19	Safety Assessment
1. <i>Withania somnifera</i>	Alkaloid (isopelletierine, anaferine, cuseohygrine, anahygrine) & steroidal lactones (withanolides, withaferins)	Viral activity is suppressed by viral protein binding, indicating therapeutic benefits [9].	High
2. <i>Allium sativum</i>	33 sulfur compounds, several enzymes, 17 amino acids, and minerals such as selenium	Used to treat respiratory illnesses such as colds, coughs, and other flu-like symptoms [1].	Medium
3. <i>Echinacea purpurea</i>	Volatile oil (containing pentadecadiene, Alkylamides, polysaccharides. Caffeic acid derivatives serve as marker	Echinacea extract is a unique herbal antiviral treatment for viruses with	Medium

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	substances pentacene, ketoalkynes, and ketoalkenes)	membranes due to its direct virucidal activity [15].	
4. <i>Ocimum gratissimum</i>	eugenol, thymol, and 1, 8-cineol are major components	Used internally in the treatment of a range of conditions including colds and influenza, fever, asthma, bronchitis, etc. [18].	High
5. <i>Curcuma longa</i>	3-6% polyphenolic compounds that are known as curcuminoids and demethoxycurcumin and bisdemethoxycurcumin	Used as an antioxidant, anti-inflammatory agent. Its inhalation is used to treat the common cold & cough [15].	High
6. <i>Andrographis paniculata</i>	diterpenoids, flavonoids, and polyphenols <sup>2</sup> are primary components	Used for the treatment of respiratory conditions such as common cold, cough, and influenza as well as upper respiratory conditions [1].	Medium
7. <i>Cinchona officinalis</i>	Contains around 30 different kinds of alkaloids such as quinidine, quinine, cinchonine, and cinchonidine etc.	Cinchona is also used for the treatment of Covid-19 pneumonia, cold symptoms, and pyrexia [29].	High
8. <i>Althaea officinalis</i>	Pectins 11%, starch 25-35%, mono- and di-saccharide saccharose 10%, uucilage 5%, flavonoids (Hypolaetin- 8 glucosideisoquercitrin, kaempferol, caffeic, pcoumaric acid) etc.	Used to treat coughs that are dry and unpleasant, as well as irritations of the oral and pharyngeal mucosa [1].	High
9. <i>Zingiber officinale</i>	active ingredients are phenolics and terpene chemicals	Used to treat colds and coughs. It has also been used as an anti-asthma and expectorant [39].	Medium



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10. <i>Cymbopogon citratus</i>	In addition to myrcene, citronellal, citronellol, linalool, and geraniol, lemon grass oil includes 65–85 percent citral. Terpenes, alcohols, ketones, aldehydes, and esters.	Used to treat symptoms of respiratory illness as well as fever	High
11. <i>Foeniculum vulgare</i>	Trans anethole (69.87 percent), fenchone (10.23 percent), estragole (5.45 percent), and limonene were among the 23 chemicals found in <i>Foeniculum vulgare</i>	Used treating coughs and colds at the same time, increasing immunity, and protecting against allergies and infections [46].	High
12. <i>Eucalyptus globulus</i>	The total lignin content (which includes acetone extractives, water-soluble material, Klason lignin, acid-soluble lignin, crystalline cellulose, amorphous) etc	Used as a respiratory antiseptic, common cold, including asthma, bronchitis, flu (influenza), and many more [49].	Medium
13. <i>Thymus vulgaris</i>	Has high concentration of oxygenated monoterpenes (56.53%) and low concentrations of monoterpene hydrocarbons (28.69%), sesquiterpene hydrocarbons (5.04%), and oxygenated sesquiterpenes (5.04%).	Used as antiviral agent to treat coughing that is caused by a cold, laryngitis, or tonsillitis, curing chest congestion[55][56].	High
14. <i>Nigella sativa</i>	fixed oil – 32 to 40% (saturated fatty acids- about 30%; palmitic acid, stearic and myristic acid	Used for fever symptoms. Coughing, wheezing, and lung function in certain asthmatics can be improved [60].	High
15. <i>Silybum marianum</i>	4–6% silymarin 20–35 percent fatty acids, including linoleic acid, make up the extract	Used to treat symptoms of respiratory infection caused by mucous membrane irritation, such as fever and catarrh [64].	High

## Herbal product in the treatment of COVID-19

Table 1: Summary of herbs used in the treatment of COVID-19

Herbal treatments have not been systematically addressed at a worldwide level to prevent, treat, mitigate, diagnose, or cure coronavirus illness in 2019. Since the SARS epidemic in 2003, China has been aggressively studying how to incorporate traditional Chinese medicine (TCM) with western therapy. The General Office of National Health and the Office of the State Administration of Traditional Chinese Medicine promoted the integration of herbal TCM and Western medicine in the treatment of respiratory problems in Coronavirus infections based on clinical outcomes, with various prescriptions advised at different stages of sickness [67]. The National Health Commission's Diagnosis and Treatment of COVID-19 have already recommended incorporating TCM into COVID-19 patients' treatment to effectively relieve symptoms such as fever, cough, sore throat, myalgia, and fatigue, shorten the course of the disease and reduce the risk of life-threatening complications [68]. Some herbal treatments are prescribed to early-stage patients by Ayurveda practitioners in India, who work on the first line of defense. The Indian Ministry of Ayush has already established the clinical settings and rules for COVID-19 research using Ayurveda, Unani, Siddha, and Homeopathy systems [69]. In Bangladesh, the Covid-19 epidemic has already reached its height. Traditional herbal medicines, according to the Directorate General of Health Services' Alternative Medical Care Department, may help boost a person's immunity and control COVID-19 symptoms. According to bdnews24.com, the Department of Health recommended drinking warm water with ginger and clove extracts, black cumin seeds, honey, and vitamin C-rich foods to keep the symptoms at bay in an April statement. Herbal foods/products were also widely used, owing to the fact that they are easily accessible in most Bangladeshi families and are well-known for their therapeutic properties. Home remedies in Bangladesh include garlic, turmeric, ginger, cinnamon, black pepper, and honey. The majority of COVID illnesses are minor and pass after a few days of rest. COVID-19 and associated symptoms are thought to be alleviated or cured by a variety of natural treatments. Similarities and patterns in the herbal remedies employed demonstrate local expertise of the individual groups in terms of illness awareness and treatment, a concept known as ethnomedicine [70].

The plants have a lot of evidence that they can help with COVID symptoms. Because of their reasonable high safety margins and emerging evidence for efficacy, herbal medicines such as *Withania somnifera*, *Ocimum gratissimum*, *Cinchona officinalis*, *Curcuma longa*, *Althaea officinalis*, *Cymbopogon citratus*, *Foeniculum vulgare*, *Thymus vulgaris*, *Nigella sativa*, and *Silybum marianum* should be considered promising candidates. Because of their anti-inflammatory, immunomodulatory, and antitussive qualities, these herbal medications may help to alleviate discomfort in the early stages of the condition.

The remainder of the herbal remedies, such as *Eucalyptus globulus*, *Zingiber officinale*, *Allium sativum*, *Echinacea purpurea*, and *Andrographis paniculata*, has a medium safety profile, but there is just not enough information concerning their efficacy on the target symptoms (cough, fever) or diseases (cold, flu). As a result, significant precautions should be taken in their usage, and much more study is needed to provide the requisite data to justify their use in the management of flu, much alone in the setting of COVID-19.

## **Chapter 6:**

# Conclusion

## **6. Conclusion:**

Because of the rise in worldwide patronage of alternative and complementary medicine in recent decades, almost 80% of the world's population relies on herbal medicine and products as a source

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of healthcare. Plants have a diverse range of bioactive phytochemicals, making them a potential source of medicines. Herbs' effectiveness against a variety of viral infections, as well as some of the clinical manifestations of COVID-19, is well documented. Herbal remedies are not a "magical cure" for solving flu-related problems, let alone COVID-19 or any other coronavirus; they cannot prevent virus infection, but they can help patients cope with symptoms and improve their overall health. It requires a thorough examination to determine if such adjuvant treatments are appropriate. However, it can be effectively used as a treatment when the severity of the illness is mild.

The potential for medicinal plants to be used to treat COVID is recognized, but there is a risk that these therapies will have undesirable side effects. As a result, further study is needed to provide strong proof of their efficacy and identify molecules with potential therapeutic applications. More research is needed to establish the optimal dosages, preparation methods, and potential combinations of these therapeutic plants.

## Chapter 7:

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