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# A Review on Herbal Immunity Booster and Nutrition – To Fight against COVID-19

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**ABSTRACT:** This review focused on the use of Nutrients and herbs for enhancing the immunity against COVID-19. In humans, corona viruses are causing the common cold and, recently, severe acute respiratory syndrome (SARS). This presents a major threat to public health. The novel coronavirus has spread rapidly to multiple countries and has been declared a pandemic by the WHO. COVID-19 is usually caused by a virus to which most probably the people with low immunity response are being affected. Herbal plants increase the intestinal beneficial bacteria which are helpful and make up the immune system. In addition to the well-known personal hygiene and preventive measures against the new coronavirus (COVID-19), we can also follow some simple recommendations regarding our nutrition that strengthen our immune system and could better prepare us for an epidemic. The virus rapidly spreads too many people within a short period of time. Good nutrition is crucial for health, particularly in times when the immune system might need to fight back. It can also potentially lead to an increased consumption of highly processed foods, which tend to be high in fats, sugars and salt. Nonetheless, even with few and limited ingredients, one can continue eating a diet that supports good health. Various studies investigated that a powerful antioxidant glutathione and a bioflavonoid Quercetin may prevent various infections including COVID-19. In conclusion, the Nutrition and Herbal plants play a vital role to enhance the immunity of people to control of COVID-19.

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### INTRODUCTION:

The expression of the current pandemic goes back to late December 2019, when an instance of unidentified pneumonia was accounted for in Wuhan, Hubei Province, People's Republic of China. Its clinical qualities are somewhat similar to those of pneumonia. After investigation on respiratory examples, China's Centre for Disease Control (CDC) specialists proclaimed that the pneumonia to be novel coronavirus pneumonia, which was brought about by novel coronavirus [1]. Infections are normally named dependent on their hereditary structure in order to make it simple for the

**Keywords:** Immunity, COVID-19, Herbal Plants, Healthy Nutrition, severe acute respiratory syndrome.

advancement of indicative tests, immunizations and medications. The infections are typically named by the International Committee on Taxonomy of Viruses (ICTV), which makes use of Virologists and other more extensive academic networks [2]. Sickesses are named to permit examination on avoidance, spread, transmissibility, seriousness and treatment of a specific illness [3]. The sole obligation of WHO is to empower Human infection readiness and reaction, so the official announcement of a malady name is finished by WHO in the International Classification of Diseases (ICD) [1].

ICTV declared extreme intense respiratory condition coronavirus-2 (SARS-CoV-2) as the name of the new infection on 11 February 2020, as the infection is hereditarily identified with the coronavirus which was answerable for SARS episode of 2003. In spite of the fact that they are connected, yet the two infections were extraordinary [2]. The name COVID-19 was reported by WHO on 11 February 2020, based on recently created rules alongside the World Organization for Animal Health (OIE) and The United Nations' Food and Agriculture Organization (FAO) [1].

To fight against different dangerous infections it is necessary to have a strong immune system. Immunity cannot build in a day or a week, but taking a well-balanced diet to keep our body in good physical and mental health builds our immune system automatically stronger [4]. Immune system is a network of special cells, tissues, proteins and organs [5]. Immunity is the state of protection against infectious disease conferred either through an immune response generated by immunization or previous infection or by other non-immunological factors [4,6].

Good nutrition is crucial for health, particularly in times when the immune system might need to fight back. Limited access to fresh foods may compromise opportunities to continue eating a healthy and varied diet. It can also potentially lead to an increased consumption of highly processed foods, which tend to be high in fats, sugars and salt. Nonetheless, even with few and limited ingredients, one can continue eating a diet that supports good health.

This article review describes the various immunity booster and mechanism of the immune system in the human body. Main objective of this review is to provide information about all type immunity boosters and Nutrients available in nature and market.

## The history of coronavirus epidemic to the pandemic in the World:

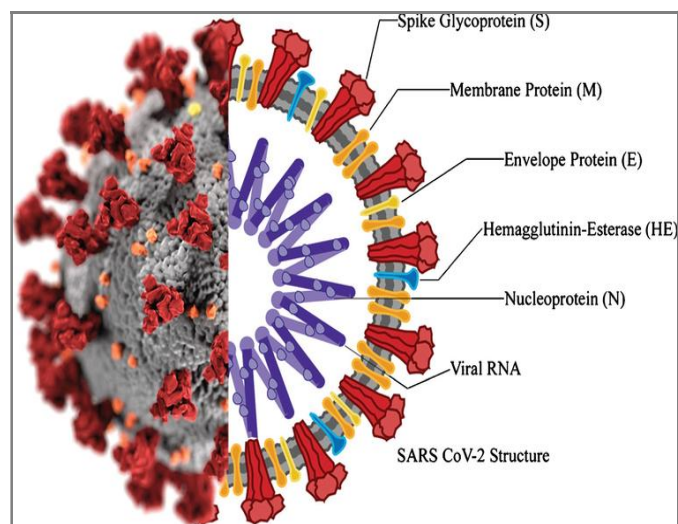
Human coronaviruses were earliest identified in the mid-1960. Coronaviruses are named for the crown-like spikes on their surface. Coronaviruses are a group of single-stranded (ss) RNA viruses that cause disease in mammals, birds and Avies. Coronaviruses cause respiratory tract (lower part) infection [7].

### SARS-CoV-1 (Epidemic):

SARS caused by SARS coronavirus -1. Primarily, it was identified in the province of Guangdong, South China in 2003. It was thought to be an animal virus from an as yet uncertain animal reservoir. According to some research it was a laboratory incident but according to another, it was transferred from animal to human, possibly bats. SARS-CoV-1 lethality rate was observed at approximately 10 %. SARS-CoV-1 was identified in more than 26 countries and causes 8000 cases all over the world, that's why WHO declared SARS-CoV1 as an epidemic [8,9].

### Symptoms of SARS-CoV-1:

The symptoms of SARS- CoV-1 infections are influenza-like fever, malaise (discomfort), diarrhea, Shivering, dry cough and shortness of breath.



**Fig 1. Symbolic representation of SARS-CoV-2 structure.**

This is an envelope, positive sense RNA virus with four main structural proteins, including spike (S) and membrane (M) glycoproteins, as well as envelope (E) and nucleocapsid (N) proteins.

### SARS-CoV-2 (Pandemic):

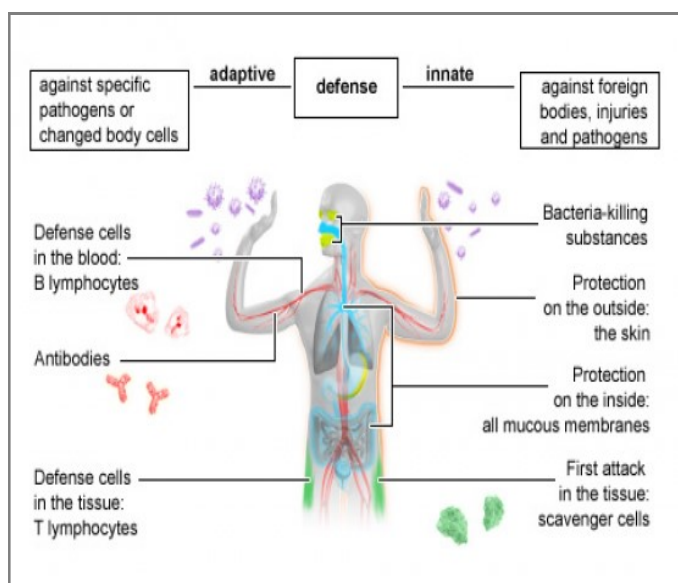
A disruption of atypical pneumonia, referred to as severe acute respiratory syndrome and first identified in

Guangdong Province, China, has spread to several countries. The severity of this disease is such that the lethality rate appears to be 3 to 6 %, although a recent report suggests this rate can be as high as 43 to 55 % in people older than 60 years <sup>[10]</sup>. An outbreak of COVID-19 caused by the 2019 novel coronavirus (SARS-CoV-2) began in Wuhan, Hubei Province, China in December 2019, SARS-CoV-2 is caused by a single stranded RNA virus.

Coronaviruses are enveloped viruses entrapping non-segmented, positive-sense and single-stranded ribonucleic acid. Their genome size ranges from 26 to 32 kb, being the largest known RNA virus. SARS-CoV-2, 3'- terminus encodes structural proteins, including Spike (S) glycoproteins, Membrane (M) glycoproteins, as well as Envelope (E) and Nucleocapsid (N) proteins is shown in Fig 1 <sup>[11]</sup>.

**Symptoms of SARS-CoV-2:**

The symptoms of virus infections are fever (83 %), dry cough (82 %), fatigue (38 %), sputum production (33 %), shortness of breath (31 %), myalgia or arthralgia (14 %), mental confusion (9 %), headache (8 %), sore throat (5 %), rhinorrhea (4 %), chest pain (2 %), diarrhoea (2 %), nausea and vomiting (1 %) <sup>[11]</sup>.



**Fig 2. Importance of the immune system in health and disease** <sup>[16]</sup>.

**IMMUNITY:**

The term immunity in a biologic context has historically referred to resistance to pathogens; however, reactions to some noninfectious substances including harmless environmental molecules, tumors, and even unaltered host components are also considered forms of immunity (Allergy, tumor immunity, and autoimmunity,

respectively). The collection of cells, tissues, and molecules that mediate these reactions is called the immune system, and the coordinated response of these cells and molecules to pathogens and other substances comprises an immune response. The most important physiologic function of the immune system is to prevent or eradicate infections shown in Fig 2.

**Types of immunity:**

Immune system can be divided into two parts-innate and adaptive. Our first line of defence the natural protection power we are born with is innate immunity and this innate response acts quickly. The protection that we gain through life when we are exposed to various diseases or protection against them for vaccination is adaptive immunity, this adaptive immunity generates antibodies when it spots an enemy in the body. The adaptive immunity takes 5 to 10 days to generate antibodies and meanwhile innate immunity keeps fighting to maintain the levels of pathogens <sup>[12-14]</sup>.

**Innate immune response:**

In an infectious process, the most common host response is to generate inflammation. Viruses in the absence of cytopathologic damage at early stages of infection inhibit the induction of acute phase protein response because early monocytes are not activated. By contrast, the participation of natural killer cells against the virus play an important role in the host's defence, they recognize cells infected by viruses in an antigen-independent manner, exert cytotoxic activities and rapidly produce large amounts of interferon-γ that participate in the activation of the adaptive immune cell.

**Acquired immune response:**

Acquired immunity relies on the capacity of immune cells to distinguish between the body's own cells and unwanted invaders. The host's cells express "self" antigens. These antigens are different from those on the surface of bacteria or on the surface of virus-infected host cells ("non-self" or "foreign" antigens). Microorganisms that overcome or circumvent the innate non-specific defence mechanisms or are administered deliberately (active immunization) come up against the host's second line of defence: acquired immunity <sup>[12,15]</sup>.

**Mechanism of Immunity:**

The immune mechanism can be produced when the infection agents attack our body or go through vaccination. However, the same immune mechanism (Antibodies and cytotoxic T-cells) which were discussed

earlier, in certain situations can cause the destruction to the cells or tissues in our body Macrophage captures engulfs and digests an antigen. Macrophage presents a fragment of the antigen on its surface and then interaction between proteins on the macrophage and helper T cell occur, activating the helper T cell proliferates into either TH 1 or TH 2 cells, which secrete different types of cytokines. Cytokines secreted by the TH 1 cell activate a cytotoxic T cell to kill the infected target cell [14,17].

**IMMUNITY BOOSTER:**

The immune system is responsible for fighting foreign invaders in the body, like pathogenic bacteria and viruses, and also destroying cells within the body when they become cancerous. Poor nutrition results in increased infections, slow healing from injury and infections, and increases susceptibility to symptoms and complications from immune system dysfunction. Studies show that immune function often decreases with age, and recent research suggests this decrease is also related to nutrition and may be slowed or even stopped by maintaining healthy nutrition. Certain foods may be helpful for boosting the immune system and preventing colds and the flu. Here's a look at five types of nutrients that your immune system needs to perform and which foods to find them in. Your immune system maintains homeostasis by defending against viruses and bacteria which can cause inflammation in the body, illness and disease. Nutritional deficiencies can impair immune function, increasing both the risk and severity of the infection [18].

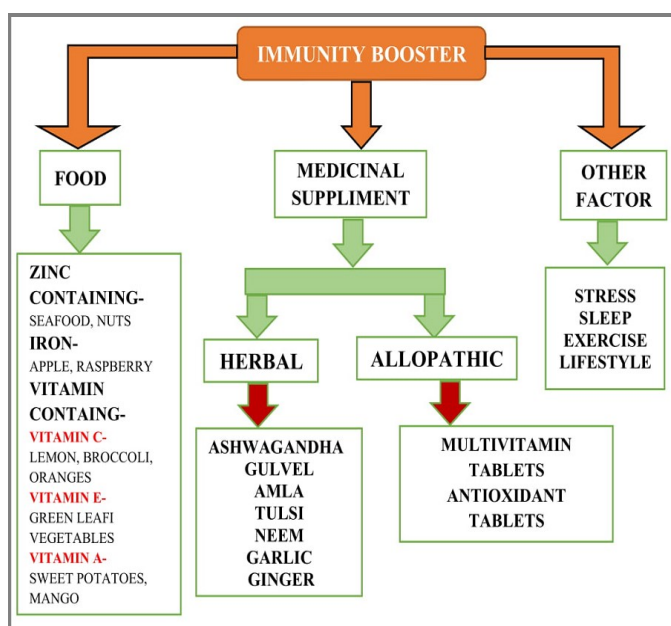


Fig 3. The various types of Immunity booster.

To boost immunity means intake or consumption of certain food that provides additional benefits to the body. To boost Immunity important to take the right kind of foods in the right quantities shown in Fig 3 [19].

**Supplements and Immunity nutrition boosting foods for COVID-19:**

While all the above-mentioned tips will definitely help, the need of the hour is a quick boost to your immunity system to keep it fighting fit. If you're concerned whether you are getting the right amount of nutrients from your diet, consult with your doctor about a supplementation regimen to boost your immune system. Here are a few common supplements and super foods that can help. There is some evidence that various micronutrient deficiencies [20]. For example, deficiencies of zinc, iron, and vitamins A, B6, C, and E alter immune responses.

**Zinc containing:**

Zinc is a mineral that's commonly added to supplements and other healthcare products like lozenges that are meant to boost your immune system. Zinc is needed for immune cell development and communication and plays an important role in inflammatory response

**Iron containing:**

Iron plays an important role in immune function. A diet containing too little iron can cause anemia and weaken the immune system. Foods rich in iron include meat, poultry, fish, shellfish, legumes, nuts, seeds, cruciferous vegetables and dried fruit. Combining iron-rich foods with vitamin C can help boost your absorption even further. Keep in mind, however, that overly high iron levels in your blood can be harmful and may actually suppress the immune system. Therefore, it's best to take iron supplements only if you have an iron deficiency [21].

**Magnesium containing:**

Magnesium is also an important electrolyte that helps our body strengthen our immune system's natural killer cells and lymphocytes. It is also a key source of energy for our cells called adenosine triphosphate (ATP), which is so crucial that without this energy, our cells cannot function properly. Magnesium helps the hemoglobin in our blood which is responsible for delivering oxygen from our lungs to the entire human body, which assists in a COVID-19 infection since the virus attacks the respiratory system. Foods rich in



magnesium are dark chocolate, black beans, avocados, and whole grains [22,23].

## VITAMINS:

### Vitamin C:

Vitamin C increases blood levels of antibodies and helps to differentiate lymphocytes (white blood cells), which helps the body determine what kind of protection is needed. One can easily consume 200 mg of vitamin C from a combination of foods such as oranges, grapefruit, kiwi, strawberries, Brussels sprouts, red and green peppers, broccoli, cooked cabbage and cauliflower. Vitamin C also functions as a powerful antioxidant, protecting against damage induced by oxidative stress, which occurs with the accumulation of reactive molecules known as free radicals [20,21].

### Vitamin E:

Vitamin E is vital for maintaining the overall health of elderly people, including their immunity. Vitamin E is a powerful antioxidant that can protect you from various infections, bacteria, and viruses. Soaked almonds, peanut butter, sunflower seeds, and even hazelnuts should be consumed to get the daily dose of vitamin E [20].

### Vitamin A:

Beta carotene gets converted to vitamin A, which is essential for a strong immune system. It works by helping antibodies respond to toxins and foreign substances. Good sources of beta carotene include sweet potatoes, carrots, mangoes, apricots, spinach, kale, broccoli, squash and cantaloupe. It promotes growth and development, and protects epithelium and mucus integrity [24].

### Vitamin B complex

B vitamins, including B12 and B6, are important for healthy immune response. Yet, significantly affects your immune system's ability to function properly, resulting in an increased risk of infection and disease [24].

## HERBS:

Modern research on remedies of natural origin has pointed out that a number of herbs have complex actions on immune function and acts at many different sites in the overall cascade of immune events and can act as strong Immune Stimulators [25-28]. According to WHO around 80 % of the world's population uses herbal

medicines to boost their immunity. And maintain primary health. This review article gives an overall view about some natural herbs.

### *WITHANIA SOMNIFERA:*

**Family:** *Solanaceae*.

**Common names:** Ashwagandha, Indian ginseng, Indian Winter Cherry.

### Biological role:

It is used as Antioxidant. On oral administration, Ashwagandha churna showed a significant increase in neutrophil adhesion and delayed-type hypersensitivity (DTH) response. It is concluded that Ashwagandha churna significantly potentiated cellular immunity [24]. Ashwagandha also provides numerous other benefits for your body and brain. For example, it can boost brain function, lower blood sugar and cortisol levels, and help fight symptoms of anxiety and depression. The whole plant of *W. somnifera* shown in Fig 4.

### Uses:

A team of Portland medical researchers has found that drinking whole cows' milk with Ashwagandha; an herb used for more than 5,000 years in the practice of Ayurvedic medicine can increase the body's white blood cells, which help boost immunity [29]. Ashwagandha has long been considered as an excellent rejuvenator [30], a general health tonic and a cure for a number of health complaints. It is a sedative, diuretic [31], anti-inflammatory [32], immune stimulatory [33], increases energy, endurance, and acts as an-adaptogen and an-anti-stress agent [34,35].



Fig 4. The whole plant of *Withania somnifera*

Ashwagandha is taken for treating cold and coughs, ulcers, emaciation, diabetes, conjunctivitis, epilepsy, insomnia, senile dementia, leprosy, Parkinson's disease, nervous disorders, rheumatism, arthritis, intestinal infections, bronchitis, asthma, impotence and a suppressant in HIV/AIDS patients. Ashwagandha has profound effects on the hematopoietic system, acting as an immunoregulatory and a chemoprotective agent.

#### **TINOSPORA CORDIFOLIA:**

It has been reported that Gulvel has potential immunomodulatory and cytotoxic effects. They have been reported to function by boosting phagocytosis activity of macrophages, production ROS in human neutrophil cells, enhancement in nitric oxide production by stimulation of macrophages.

**Family:** *Menispermaceae*.

**Common name:** Gulvel.

#### **Chemical constituents:**

Active compounds 11-hydroxymustakone, N-methyl-2-pyrrolidone, N-formylannonain, cordifolioside A, magnoflorine, tinocordiside and syringing. The whole plant of *T. cordifolia* shown in Fig 5.



**Fig 5. The leaves of *Tinospora cordifolia*.**

**Biological name:** *Tinospora cordifolia*.

#### **Biological role:**

*T. cordifolia* extracts are extensively used in various herbal preparations for the treatment of different ailments for its anti-periodic, anti-spasmodic, anti-microbial, anti-osteoporotic, anti-inflammatory, anti-arthritic, anti-allergic, and anti-diabetic properties

#### **Uses:**

*Tinospora cordifolia* has an importance in traditional Ayurvedic medicine used for ages in the treatment of fever, jaundice, chronic diarrhea, cancer, dysentery,

bone fracture, pain, asthma, skin disease, poisonous insect, snake bite, eye disorders [20,24].

#### **PANAX GINSENG:**

**Family:** *Araliaceae*.

#### **Common names:**

Asiatic ginseng, Chinese ginseng, five fingers, Japanese ginseng, jintsam.

#### **Chemicals:**

*Panax ginseng* contains triterpene glycosides, or saponins, commonly referred to as ginsenosides. Many active compounds can be found in all parts of the plant, including amino acids, alkaloids, phenols, proteins, polypeptides, and vitamins B1 and B2. The whole plant of *Panax ginseng* shown in Fig 6.



**Fig 6. The whole plant of *Panax ginseng*.**

#### **Uses:**

Ginseng has been used for a variety of purposes for about 5000 years. It has been used to increase physical endurance and lessen fatigue, to improve the ability to cope with stress, and to improve concentration. It is also used for anemia, diabetes, gastritis, neurasthenia, erectile dysfunction, impotence and male fertility, fever, hangover, and asthma. *P. ginseng* is also used for bleeding disorders, loss of appetite, vomiting, colitis, dysentery, cancer, insomnia, neuralgia, rheumatism, dizziness, headache, convulsions, disorders of pregnancy and childbirth, hot flashes due to menopause, and to slow the aging process [36-38]. Research reviews postulate that extracts of *P. ginseng* affect the hypothalamus-pituitary-adrenal axis and the immune system. The authors concluded ginseng extract stimulates the immune system and the standardized extract is more effective than the liquid ginseng extract [39]. Some of the



same researchers examined the effects of *P. ginseng* extract on the immune response to vaccination.

#### **EMBLICA OFFICINALIS:**

The fruit extract of *Emblica officinalis* (Amla) has been shown to have free radical scavenging activity and immunomodulatory properties.

**Family:** *Phyllanthaceae*.

**Common name:** Amla.

#### **Botanical name:**

*Phyllanthus emblica*, *Emblica arborea* Raf, Amla.

#### **Chemical constituents:**

Emblicanin A (37 %), emblicanin B (33 %), punigluconin (12 %), and pedunculagin (14 %) [10]. Amla also contains punicafofin and phyllanemblinin A, phyllanemblin other polyphenols, such as flavonoids, kaempferol, ellagic acid, and gallic acid. The fruit part of *E. officinalis* shown in Fig 7.



**Fig 7.** The fruit part of *Emblica officinalis*.

#### **Uses:**

Amla is Vitamin C rich fruit which boosts the production of white blood cells (WBC) in the body that help in fighting several infections and diseases. Amla is also rich in Iron, calcium and several other minerals which make the complete nutritional fruit.

#### **ECHINACEA PERPUREA:**

**Family:** *Asteraceae*.

**Common names:**

Purple coneflower, Sampson, Snakeroot, Red sunflower.

#### **Chemical constituents:**

Echinacea are known to include mucopolycaccharides, echinacoside, echinaceine, isobutylmines, linoleic and palmetic acids, essential oils, glycosides, inulin,

polyacetylenes, sesquiterenes, betaine, and phenolics. Echinacea also contains small amounts of iron, iodine, copper, potassium, sulphur, vitamin A, vitamin E and vitamin C [40-42].

#### **Uses:**

Research to date shows that echinacea can help treat a cold, but it won't prevent one. Echinacea is also used against many other infections including the urinary tract infections, vaginal yeast infections, genital herpes, bloodstream infections (septicemia), gum disease, tonsillitis, streptococcus infections, syphilis, typhoid, malaria and diphtheria. Echinacea is one of the most popular herbs and has been extensively studied for its effects on the immune system. It has been used as an immune stimulant for a variety of afflictions including colds and flu. Echinacea is widely promoted for its ability to "boost" the immune system [43,44]. The fruit part of *Echinacea perpurea* shown in Fig 8.



**Fig 8.** The flowering plant of of *Emblica officinalis*.

#### **OCIMUM TENUIFLORUM:**

Tulsi is extremely useful for treating bacterial and fungal infections as well as immunological disorders like allergies and asthma. Explaining the benefits of Tulsi, Haritha says, it is rich in Vitamin C and Zinc and acts as a natural immune booster [12,14]. The leaves of *Ocimum tenuiflorum* shown in Fig 9.

**Synonym:** *Ocimum sanctum*.

**Family:** *Lamiaceae*.

**Biological name:** *Ocimum tenuiflorum*.

#### **Chemical constituents:**

Oleanolic acid, Ursolic acid, Rosmarinic acid, Eugenol, Carvacrol, Linalool, and  $\beta$ -caryophyllene.

**Uses:**

Tulsi plant indoors can help protect you from certain infections and diseases such as cold, cough, and viral infections. These strong disinfectant and germicidal factors are not the only reason why Tulsi is a great herb for boosting your immunity <sup>[45]</sup>.

**Biological role:**

Antibiotic, Anti-bacterial, Antiviral, Anti-stress agent, anti-inflammatory, Anti-fungal.



**Fig 9. The leaves of *Ocimum tenuiflorum*.**

**UNCARIA TOMENTOSA:**

Cat's claw has several groups of active components that account for much of the plant's actions and uses. The leaves of *Uncaria tomentosa* shown in Fig 10.



**Fig 10. The whole plant of *Uncaria Tomentosa*.**

**Family:** *Rubiaceae*.

**Common names:** Cat's claw, una de gato

**Chemical constituents:**

These include oxindole alkaloids (rhynchophylline, alloptropodine, alloisopteropodine, isopteropodine, and uncarine), quinovic acid, triterpenes, polyphenols,

proanthocyanidins, phytosterols (beta-sitosterol, stigmasterol, and campesterol), and catechin tannins <sup>[46]</sup>.

**Uses:**

These compounds possess immune augmenting, antimicrobial, anti-tumor, anti-allergic, anti-ulcer, antioxidant, anti-inflammatory and adaptogen properties <sup>[46,47]</sup>. Many studies have shown it to enhance immunity and heal digestive and intestinal disorders making it a choice among many for the treatment of Acquired Immune Deficiency Syndrome (AIDS) and Human Immunodeficiency Virus (HIV) infection; cancer <sup>[48]</sup>.

**AZADIRACHTA INDICA:**

Purified extracts of neem contained immunomodulators that stimulate the cells and macrophages that terminate. The Leaves of *Azadirachta indica* shown in Fig 11.



**Fig 11. The leaves of *Azadirachta indica*.**

**Biological name:** *Azadirachta indica*.

**Family:** *Meliaceae*

**Chemical constituents:**

**Neem leaves:** Azadirachtin, meliacin, quercetin, nembosterol, ascorbic acid, carotenoids, amino acid etc.

**Neem seed:** Azadirachtin

**Neem kernals:** oil of margosa.

**Neem barks:** Nimbin, nimbinine, nimbidine, nimbosterol, nimbidol and margosin.

**Biological source:** Neem consists of the fresh or dried leaves and seed oil of *A. indica*.

**Biological role:**

Neem plants parts show antimicrobial role through inhibitory effect on microbial growth/potentiality of cell wall breakdown. Azadirachtin, a complex tetranortriterpenoid limonoid present in seeds, is the key constituent responsible for both antifeedant and toxic effects in insects.



**Use:**

Neem helps boost your immune system while cooling down your body internally. It possesses both anti-bacterial and anti-fungal properties that help keep your skin clean, radiant and healthy. Neem also has blood-purifying properties [20,24,48].

**ALOE BARBADENSIS:**

**Family:** *Asphodelaceae*.

**Common name:** *Aloe vera*.

**Chemical constituents:**

Vitamins, enzymes, minerals, sugars, lignin, saponins, salicylic acids and amino acids. It contains vitamins A (beta-carotene), C and E, which are antioxidants. It also contains vitamin B12, folic acid, and choline. The whole parts of *Aloe barbadensis* shown in Fig 12.



**Fig 12. The whole parts of *Aloe barbadensis*.**

**Uses:**

Support the immune and cardiovascular system. *A. Vera* contains amino acids, minerals and vitamins [45].

**ALLIUM SATIVUM:**

Garlic is considered as a capable candidate for maintaining the homeostasis of the immune system. It has been found that garlic protein fraction has a stimulatory effect on lymphocytes, Natural Killer (NK) cells, and macrophages cytotoxicity. The bulb Parts of *Allium sativum* shown in Fig 13.

**Family:** *Alliaceae*.

**Common name:** Lahsun.

**Chemical constituents:**

Carbohydrates, protein, mucilago.

**Biological source:**

It consists of ripe bulbs of allium sativum.

**Biological role:**

Antioxidant, anti-inflammatory, Immunomodulator, Antifungal, antibacterial.



**Fig 13. The bulb Parts of *Allium sativum*.**

**Uses:**

The main ingredient of garlic which fights the germs is Allicin and the best way to use garlic as an immune booster is to eat it raw. Chewing garlic releases the Allicin in the mouth which is absorbed by the body [47].

**CURCUMA LONGA:**

**Family:** *Zingiberaceae*.

**Botanical name:** *Curcuma longa*.

**Common name:** Turmeric

**Biological role:**

Antiseptic, Immunomodulator, Anti-inflammatory.

**Chemical constituents:**

Turmeric powder is about 60 to 70 % carbohydrates, 6 to 13 % water, 6 to 8 % protein, 5 to 10 % fat, 3 to 7 % dietary minerals, 3 to 7 % essential oils, 2 to 7 % dietary fiber, and 1 to 6 % curcuminoids.



**Fig 14. The root Parts of *Curcuma longa*.**

**Uses:**

Turmeric is among the richest food sources of Iron 67.8 mg per 100 g of turmeric powder. One teaspoon (3 g) of turmeric powder provides 2 mg of Iron. Iron is important

for improving immunities power and turmeric has riches Iron (Fig 14) <sup>[24]</sup>.

#### **ZINGIBER OFFICINALE:**

Ginger is one of the most effective natural Immunomodulators. *In vitro* study found that ginger inhibited lymphocyte proliferation; this was mediated by reductions in IL-2 and IL-10 production <sup>[26]</sup>. Ginger essential oil showed improvement in humoral and cell mediated immune response in immune suppressed mice. The Root Parts of *Z. officinale* shown in Fig 15.



**Fig 15. The root parts of *Zingiber officinale*.**

**Family:** *Zingiberaceae*.

**Common name-** Adarak, Ginger.

**Chemical constituents:** 6 - gingerol, 6 - shogal, 6 – parasol.

#### **Biological source:**

Ginger consists of the rhizomes, Roscoe and dried in the sun.

#### **Biological role:**

Antioxidant, Anti-inflammatory, Anticancer, Immunomodulatory, Antidiabetic.

#### **Use:**

Ginger can help improve immune health due to its antioxidant and anti-inflammatory effects. In fact, starting your morning with a glass of ginger tea or ginger kashayam may ward off illness and boost the immune system <sup>[48]</sup>.

#### **OTHER WAYS TO BOOST THE IMMUNE SYSTEM:**

- Don't smoke
- Eat a diet high in fruits and vegetables
- Exercise regularly

- Maintain a healthy weight
- If you drink alcohol, drink only in moderation
- Get adequate sleep
- Take steps to avoid infection, such as washing your hands frequently and cooking meats thoroughly
- Try to minimize stress

#### **Exercise:**

Regular exercise is one of the pillars of healthy living. It improves cardiovascular health, lowers blood pressure, helps control body weight, and protects against a variety of diseases <sup>[47]</sup>. But does it help to boost your immune system naturally and keep it healthy? Just like a healthy diet, exercise can contribute to general good health and therefore to a healthy immune system.

#### **Don't Compromise on Sleep:**

Good snooze time for 7 to 8 h is the best way to help your body build immunity; lesser sleep will leave you tired and impair your brain activity. The lack of sleep will prevent the body from resting and this will impair other bodily functions that will have a direct impact on your immunity. Lack of sleep adversely affects the action of the flu vaccine.

#### **Stay hydrated:**

Drink up to 8 to 10 glasses of water every day, to stay hydrated. Hydration will help flush out the toxins from the body and lower the chances of flu. Other alternatives include juices made of citrus fruits and coconut water, to beat the heat.

#### **Improve your diet:**

The food you eat plays a key aspect in determining your overall health and immunity. Eat low carb diets, as this will help control high blood sugar and pressure. A low carb diet will help slow down diabetes and focus on a protein-rich diet to keep you in good shape. And regularly consume vegetables and fruits rich in Beta carotene, Ascorbic acid and other essential vitamins. Certain foods like mushrooms, tomato, bell pepper and green vegetables like broccoli, spinach are also good options to build resilience in the body against infections.

#### **CONCLUSION:**

People with low immunity are more prone to this world pandemic named as COVID-19. To help or boost the immunity, the various Herbs play a vital role by promoting beneficial bacteria in the body. Various vitamins like C, D, and E are investigated to provide important aspects for improving immunity. Herbs like

*Withania somnifera*, *Tinospora cordifolia*, *Panax ginseng*, *Emblica officinalis*, *Zingiber officinale*, *Curcuma longa*, *Allium sativum*, *Aloe barbadensis*, *Azadirachta indica*, *Ocimum tenuiflorum*, *Echinacea purpurea* and many more. While other vegetables are rich in vitamin C and are good for immunity. Proper nutrition and hydration improve health and immunity, they are not magic bullets. People living with chronic illnesses who have suspected or confirmed COVID-19 may need support with their mental health and diet to ensure they keep in good health.

Future aspects of this account for more research which is needed significantly on physical behaviors or exercises and their role in immunity-related issues thus preventing COVID-19.

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