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Covid-19: Herbs That Strengthen the Immune System - A Review and Perspective

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ABSTRACT

Covid-19, caused by coronavirus 2 (SARS-CoV-2), a respiratory syndrome is a novel disease of coronavirus which is a inter human transmitted. (1) It is originally zoonotic and in this situation COVID-19 pandemic, a lot of interest to strengthen the immune system, and build a defence mechanism against the deadly virus has been increased. According to World Health Organisation herbal medicines are using about 80% population for their primary health care to increase the natural immunity of body. Many foods and herbs possess antiviral property against SARS-CoV-2 and can be beneficial against COVID-19. Foods and herbs could be beneficial as complementary therapy to prevent infection and strengthen immunity of human beings. (2) Clinically approved antiviral drugs are currently available for only 10 of the more than 220 viruses known to infect humans. The SARS-CoV-2 outbreak has exposed the critical need for compounds that can be rapidly mobilised for the treatment of re-emerging or emerging viral diseases along with vaccine development/developed. The strategies for combatting viral diseases are prevention (vaccines) and treatment (antiviral drugs and antibodies) (3).

INTRODUCTION:-

SARS-CoV-2 having 88% similar full-length genomes to the bat so it is postulated that it is derived from bat. (2) Phylogenetic analysis indicate that SARS-CoV-2 belongs to the subgenus *Sarbecovirus* of the genus *Betacoronavirus*. As per homology modelling the receptor-binding domain structure of SARS-CoV-1 is similar to that of SARS-CoV-2. (4) SARS-CoV-2 might amplify in the intermediate mammalian host, probably pangolin, since the whole-genome of pangolin-CoV is 91.02% identical to SARS-CoV-2(5). Molecular and phylogenetic data showed that SARS-CoV-2 did not emerge directly from the pangolin-CoV(6). To reduce the future zoonotic transmission trading of pangolin in wet markets should therefore be strictly prohibited (7,8).

The development of antiviral therapies requires a fundamental understanding of the chemical biology of the virus and in particular its interaction with the host cell. As obligate parasites, all viruses are dependent on the cellular processes of their host cells and as such, share the basic features of their infectious lifecycle (3).

Most approved antiviral drugs target a viral enzyme that plays an essential role in virus replication. Viral (DNA or RNA) polymerases are highly successful drug targets. Polymerase inhibitors can be divided into two broad classes (i) nucleos(t)ide analogues and (ii) non-nucleos(t)ide allosteric inhibitors. Allosteric inhibitors bind the polymerase, but not at the catalytic active site, causing conformational changes that impair polymerase function.

Development of an effective antiviral drug is typically followed by expansion of the successful strategy with numerous chemical variations providing improvements in parameters including affinity, pharmacology, toxicity and drug resistance profiles. Expansion of the successful structure(s) to other viruses beyond the initial clinical target is also possible, especially for polymerase inhibitors because all RNA viruses encode an RNA-dependent RNA polymerase (RdRp). Drugs targeting RdRps may have the capacity for activity against different viruses for which antiviral drugs are not currently available.

Indeed, remdesivir, a monophosphate prodrug of a cyano adenosine nucleoside analogue, has in vitro and in vivo activity against multiple RNA virus families including filoviruses (EBOV) and coronaviruses (SARS-CoV-1, SARS-CoV-2, MERS-CoV) and has recently been granted FDA emergency use authorization for COVID-19 treatment.

Another example of a broadly acting antiviral is the guanosine nucleoside analogue inhibitor ribavirin.

Favipiravir, a prodrug that is ultimately converted to its ribofuranosyl-triphosphate metabolite (favipiravir-RTP), incorporated as a pseudopurine by the viral RdRp. Favipiravir is incorporated at high rates resulting in lethal mutagenesis of SARS-CoV-2 viral RNA during replication in vitro and the compound is currently in clinical trials for treating COVID-19.

The global campaign to find SARS-CoV-2 antivirals will undoubtedly result in the development innovative approaches to screening, accelerated clinical testing and rapid manufacturing. (3,9,10,11,12,13,14,15,16).

Herbal medicines have antiviral activity on influenza virus, SARS-CoV-1, and SARS-CoV-2 have already been reported. Due to the absence of prescribed drugs against COVID-19/SARS-COV-2, the use of dietary therapy and herbal medicines as complementary COVID-19 have been promoted gradually. Herbal medicines are used by doctors and researchers for clinical trials against SARS-CoV2. (17,18) While drugs remain under development a complementary COVID-19 therapy is to be using herbal medicines to prevent SARS-CoV-2 infections.

Herbal medicines

According to World Health Organisation herbal medicines are using about 80% population for their primary health care to increase the natural immunity of body. Many foods and herbs possess antiviral property against SARS-CoV-2 and can be beneficial against COVID-19. Foods and herbs could be beneficial as complementary therapy to prevent infection and strengthen immunity of human beings. (2)

Herbs and spices that can help to improve immunity are:-

1-Holy Basil:-

This aromatic leaf **(Figure 1)** can be your primary line of defence against COVID-19. Tulsi or basil is a powerful germicide. Because of its phytochemicals and antioxidants, it can effectively locate germs, viruses and bacteria the moment they enter the body and destroy them. The leaves of this plant are rich in phytonutrients (such as antioxidants, flavanol), vitamins, and minerals, and Eugenol. It is a bioactive compound having anti-microbial, anti-

fungal and anti-bacterial properties and reduces stress and plasma glucose levels. Some of the phytochemical constituents of tulsi are oleanolic acid, ursolic acid, rosmarinic acid, eugenol, carvacrol, linalool, and β-caryophyllene .(10) Tulsi essential oil consists mostly of eugenol β-elemene , β-caryophyllene , and germacrene , and various trace compounds, mostly terpenes.(19)

Figure 1:-Leaf of Tulsi

2-Ginger :-

Ginger **(Figure 2)** contains gingerol – an antioxidant that can power up our immune system and kill viruses. Ginger is particularly good in preventing respiratory tract infections.

It has anti-inflammatory, antifungal, and anti-cancer properties. Ginger has been extensively used for curing colds and coughs, nausea, asthma, travel sickness, morning sickness, arthritis, gastrointestinal complaints and even depression as traditional medicine.

Figure 2:-Ginger

3- Fenugreek :-

Fenugreek **(Figure 3)** (*Trigonella foenum-graecum***)** is an annual plant in the family Fabaceae, with leaves consisting of three small obovate to oblong leaflets. Its seeds contain flavonoids, alkaloids, coumarins, vitamins, and saponins. The most prevalent alkaloid is trigonelline and coumarins include cinnamic acid and scopoletin.(20) Research into whether fenugreek reduces biomarkers in people with diabetes and with pre-diabetic conditions is of limited quality.(21)

It acts as a natural anti-oxidant and strengthens immune system. It is not only used as an herb, spice, vegetable but also as a condiment in artificial flavouring of maple syrup or in the production of steroids. Fenugreek seeds are used in pickles as they are rich in vitamin E.

Figure 3:- Fenugreek

4-Garlic :-

Garlic **(Figure 4)** (*Allium sativum*) is a species in the onion genus, *Allium*. Its close relatives include the onion, shallot, leek, chive (22)and Chinese onion.(23) *Allium sativum* is a perennial flowering plant growing from a bulb. It has very high anti-oxidant properties so that it reduces stress and high blood pressure. It also helps to enhance thiamine (vitamin B1) absorption in the body and prevents beriberi. It is always best to used chopped garlic because it works better when in contact with oxygen.

Figure 4:-Garlic

5- Turmeric :-

Turmeric **(Figure 5)** is a flowering plant, *Curcuma longa* of the ginger family, Zingiberaceae, the roots of which are used in cooking.[3] The plant is a perennial, rhizomatous, herbaceous plant. Turmeric powder is about 60–70% carbohydrates, 6–13% water, 6–8% protein, 5–10% fat, 3–7% dietary minerals, 3–7% essential oils, 2–7% dietary fiber, and 1–6% curcuminoids. Phytochemical components of turmeric include diarylheptanoids, a class including numerous curcuminoids, such as curcumin, demethoxycurcumin, and bisdemethoxycurcumin.(24) Some 34 essential oils are present in turmeric, among which turmerone, germacrone, atlantone, and zingiberene are major constituents.(25,26,27) Curcumin, acts as an anti-inflammatory agent. It can be consumed as a decoction (kadha) made from grated ginger, tulsi and turmeric once daily to improve immunity as recommended.

Figure 5 :-Turmeric

6-Moringa :-

Moringa oleifera **(Figure 6)** is a fast-growing, drought-resistant tree of the family Moringaceae.

The leaves are the most nutritious part of the plant, being a significant source of B vitamins, vitamin C, provitamin A as beta-carotene, vitamin K, manganese, and protein.(28,29) Moringa is a herb that can ward off many health complications. It contains 7 times more Vitamin C than even oranges. Vitamin C is the chief nutrient that our bodies need to build strong immunity. moringa also contains some other vital nutrients that strengthen cells, muscles, tissues and help body heal. Consume moringa for its high levels of potassium, iron, calcium and amino acids.

Figure 6:-Moringa

***7*-Neem :-**

Azadirachta indica, (**Figure 7)** commonly known as neem, nimtree or Indian lilac, is a tree in the mahogany family Meliaceae. Since time immemorial, neem has been respected and widely used as an immunity booster. It is very effective in keeping the body safe from attacks by harmful pathogens as having anti-viral, anti-bacterial and anti-fungal properties.

Neem can also keep blood clean. It purifies the blood by flushing away toxins and this can strengthen immunity.

Figure 7 :-Neem

8-Ashwagandha :-

Withania somnifera, **(Figure 8)** known commonly as ashwagandha, Indian ginseng, poison gooseberry, or winter cherry, is a plant in the Solanaceae or nightshade family.

Ashwagandha is an adaptogen, which means it can decrease stress levels. Stress lowers the immune response and makes the body vulnerable to viral infections.

The main phytochemical constituents are withanolides – which are triterpene lactones – withanolides, withaferin A, alkaloids, steroidal lactones, tropine, and cuscohygrine.Some 40 withanolides, 12 alkaloids, and numerous sitoindosides have been isolated. Withanolides are structurally similar to the ginsenosides of Panax ginseng, leading to a common name for W. somnifera, "Indian ginseng".(30)

Figure 8:-Ashwagandha

9-Black cumin :-

Nigella sativa **(Figure 9)** (black caraway, also known as black cumin, nigella, kalojeera, kalonji or kalanji) is an annual flowering plant in the family Ranunculaceae. Oils are 32% to 40% of the total composition of N. sativa seeds(31,32)N. sativa oil contains linoleic acid, oleic acid, palmitic acid, and trans-anethole, and other minor constituents, such as nigellicine, nigellidine, nigellimine, and nigellimine N-oxide.(31) Aromatics include thymoquinone, dihydrothymoquinone, p-cymene, carvacrol, α-thujene, thymol, α-pinene, β-pinene and trans-anethole. Protein and various alkaloids are present in the seeds.(31) Black cumin extracts can keep safe from a range of viruses and bacteria that attack your immune system. Both black cumin seeds and oil act as antioxidants and help flush out free radicals that weaken immunity.

Figure 9:-Black Cumin

10-Triphala :-

Triphala (the three fruits) is an Ayurvedic, polyherbal preparation comprising three ingredients. The ingredients of all fruits are bibhitaki, amalaki, and haritaki. Each fruit is thought to positively impact the body's three doshas. In Ayurvedic medicine, doshas are elemental forces believed to permeate body, mind, and spirit. Triphala has been used in Ayurvedic medicine for thousands of years. It's thought to support bowel health and aid digestion. As an antioxidant, it's also thought to detoxify the body and support the immune system. It is loaded with Vitamin C and Vitamin A- both of which strengthen immunity.

Food and Herbs against Covid 19:-

Herbal medicines are potential effective antiviral against SARS-CoV-2 and prophylactic agents against COVID-1. There are following applications of dietary therapy and herbal medicines against COVID-19-

(1) to prevent infection and strengthen immunity;

(2) Coating on the mask as an antiviral agent;

(3) to stop aerosol transmission used as an air-disinfectant; and

(4) to provide a disinfected environment used as a surface sanitizing agent.

Surgical masks are necessary to prevent virus spreading into the air and transmission to humans. (33,34) But after removal of mask, the virus remains attached on the mask and is probably re-aerosolized and increasing the risk of human infection. There is need to coating the mask with an antiviral compound, considering its toxicity.

Aromatherapy has been used to treat various diseases for years, (35) and by numerous studies, it is confirmed the antimicrobial and antiviral activity of essential oils. (36) Essential oils vapours could work against airborne bacteria and viruses. The anti-influenza virus activity of some essential oil vapours, has already been reported. These oils vapours inactivation of the principal external proteins of the influenza virus mainly hemagglutinin protein, and in this way it is beneficial for those people suffering from influenza or other respiratory viral infections. Aerosolized tea tree oil inhibits airborne viral particles of H11N9 using essential oils subtype avian influenza virus. Air sterilization using essential oils could be a good way to prevent COVID-19, without human health damage. The minimum essential oil concentration needed for SARS-CoV-2 inhibition should be investigated.

Antiviral Activity of Herbal Medicines and Phytochemicals against Coronaviruses

Aromatic herbs, herbal teas, culinary spices, and medicinal plants used in ethnobotanical treatments may represent highly useful sources. During the 2003 SARS outbreak [40], the efficacy and performance of herbal therapy and phytomedicine for preventing viral infections was illustrated. As such, different countries, are encouraging the use of herbal and medicinal plants in fighting SARS-CoV-2 infection (37,38,39,40,41,42,43,44,45,46).

After the outbreak of SARS-CoV, first described in early 2003, researchers and scientists have been dynamically trying to explore different antiviral extracts, drugs, and molecules against SARS-CoV. This had led a group of experts to screen more than 200 medicinal plants, culinary spices, and aromatic herbs for their antiviral properties against this SARS-CoV strain (47). In fact, after the outbreak of SARS, many groups started to search for anti-coronavirus agents, including some natural compounds and phytochemical extracts that exist in traditional herbal medicines (48,49,50,51).

CONCLUSIONS:-

Limited number of allopathic medicines are effective against COVID-19. Current literature provides obvious evidence supporting diet and herbal medicines as potential effective antiviral against SARS-CoV-2 and as preventive agents against COVID-19. Thus, diet and herbal medicines could be a complementary preventive therapy for COVID-19. However, experimental validation in SARS-Cov-2 infection models and COVID-19 patients is required.

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