

Review Article : Open Access

Special Issue2 (COVID-19)

A scoping review on herbs and spices with special reference to COVID-19 pandemic

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Article Info

Article history

Received 1 November 2021
Revised 15 December 2021
Accepted 16 December 2021
Published Online 30 December 2021

Keywords

COVID-19 pandemic
SARS-CoV-2
Herbs and spices
Immunity
Medicinal plants
Antimicrobial

Abstract

The world is facing medical crisis due to the pandemic created by COVID-19. Due to COVID-19, not only our country but the whole world is passing through economic crisis also. As there is no specific treatment for the infection caused by SARS-CoV-2 and it affects the people with weak immunity more adversely so, many people including scientists are looking forward to increase the immunity by using medicinal plants, *i.e.*, herbs and spices. Vitamin C is also being widely used by the doctors across the world to increase the immunity, but as herbs and spices are easily available and have been widely used as antimicrobial and anti-inflammatory agent since ancient time so, they can be used both as effective immunity booster as well as antiviral agent as shown by some compounds found in the herbs and spices.

1. Introduction

In December 2019, people from Wuhan city of China were identified as suffering from pneumonia like viral disease. The virus was named as SARS-CoV-2 by ICTV on February 11, 2020. And the disease was named as coronavirus disease, COVID-19 by WHO on the same day. Soon the cases start to increase rapidly and WHO declared it as PHEIC, Public Health Emergency of International Concern on 30th January, 2020 and then as global pandemic on 11th March, 2020. Some symptoms of the disease are dry cough, fever, diarrhea, shortness of breath, respiratory distress, *etc.* The treatment of the disease involves the symptomatic release of the symptoms and there is specific treatment for the disease. So, many researchers are interested for the use of herbs and spices which have potency against the viruses as well as increase the immune power of the person. Here are some of the common herbs and spices which have been evaluated for their use against the COVID-19 (Tian *et al.*, 2020).

2. Some important herbs found to be effective against COVID-19

2.1 Ashwagandha (*Withania somnifera*)

Ashwagandha is found to be very effective against the cardiovascular diseases, neurodegenerative disorders, asthma and cancer by altering the level of leucocytes, lymphocytes, neutrophils, immune complexes and immunoglobulins (Ig) A, G and M. In COPD, it reduces the tiredness, coughing and breathlessness. Further more, it reduces the pulmonary fibrosis also.

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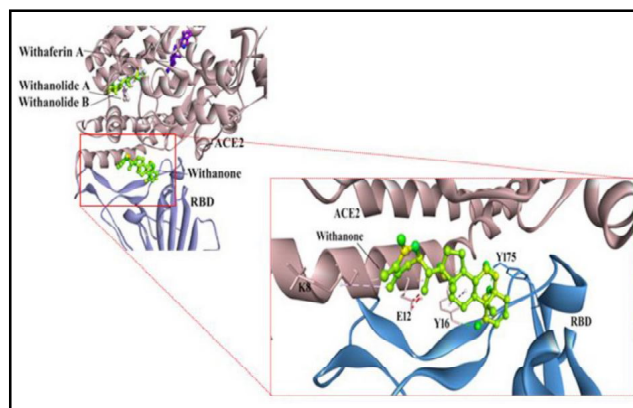
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Withanone, a compound from *Withania somnifera* also interferes with the binding of COVID-19 to host cell ACE2 through RBD (Receptor Binding Domain) of its spike protein and, thus decreasing its efficacy to enter into the host cell (Kaur *et al.*, 2015; Bale *et al.*, 2018; Balkrishna *et al.*, 2020; Murlikrishna *et al.*, 2021).

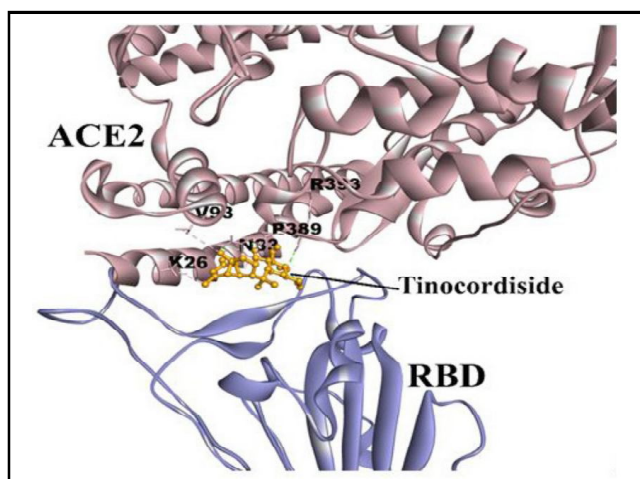


Binding of withanone with ACE2-RBD complex.

2.2 Giloy (*Tinospora cordifolia*)

Giloy is having both antimicrobial as well as immunostimulant properties. It is found to be very effective against fever including dengue, jaundice, asthma and inflammations including arthritis and gout and tuberculosis. It is found to have antiviral properties especially against retroviruses like HIV, HSV, *etc.*

Tinocodiside, a compound from giloy, interferes with the binding of COVID-19 to host cell ACE2 through RBD (Receptor Binding Domain) of its spike protein and, thus decreasing its efficacy to enter into the host cell similar to that of withanone from ashwagandha (Sinha *et al.*, 2004; Mishra *et al.*, 2012; Gupta *et al.*, 2016; Sharma *et al.*, 2019).

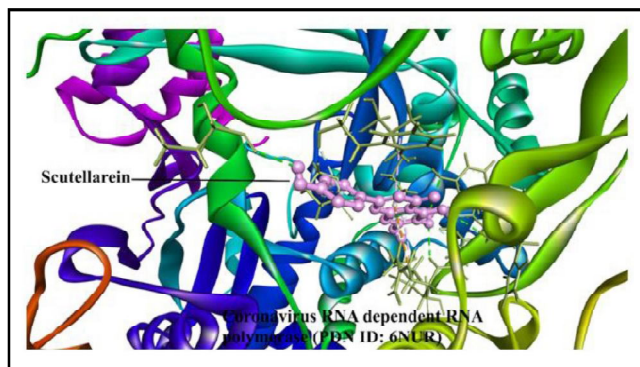


Interactions (docking) of tinocordiside with ACE2-RBD complex.

2.3 Tulsi (*Ocimum sanctum*)

Tulsi is rich in the medicinal properties, *i.e.*, why it is also known as “Mother Medicine of Nature” and “Queen of Herbs” as it is having antimicrobial, antipyretic, anti-inflammatory, antiallergic, broncho-dilator as well as neuro- and cardio-protective properties.

Scutellarein, a compound from tulsi is found to be very effective against the viruses. It is also an inhibitor of SARS-CoV helicase, an enzyme essential for the replication of the SARS-CoV-2 virus, the causative agent of COVID-19 (Priyabrata *et al.*, 2010; Mahajan *et al.*, 2013; Cohen, 2014; Pandey *et al.*, 2015; Bhalla *et al.*, 2017; Vinaya, 2017; Meghwani, 2018)



Docking of scutellarein in catalytic cleft of RDRP.

2.4 Neem (*Azadirachta indica*)

Neem declared as “Tree of the 21st century” by UNEP, has been used extensively against several infections due to its antimicrobial properties. Hyperoside, a compound found in the leaves of the neem has potential against the influenza and, so it can be used against the ILI (Influenza Like Illness) like COVID-19 and has showed best results when used along with drugs like LGH, naproxen, BMS-885838, and BMS-883559 with conserved residues of nucleoprotein of influenza virus (Ahmad *et al.*, 2016). Along with tulsi, it acts as effective inhibitor of SARS-CoV-2 by inhibiting its attachment and replication.

3. Some important spices found to be effective against COVID-19

3.1 Turmeric (*Curcuma longa*)

Turmeric is categorized as “Generally Recognized as Safe” by FDA as it (curcumin) does not cause any side-effects or toxicity even at higher doses of 2,500 to 8,000 mg per day for 3 months (Irshad *et al.*, 2017).

Curcumin, a compound from it shows anti-inflammatory, antiangiogenic, anti-neoplastic and antiviral properties. It acts as an inhibitor of replication of the virus. It also binds and inhibits the SARS-CoV-2 protease, spike glycoprotein RBD, and PD-ACE2, which are involved in virus infection.

3.2 Ginger (*Zingiber officinale*)

Ginger is called as sunthi in dry form and is one of the important medicinal plants in Ayurveda and herbal drug in Unani system. It shows antipyretic, antiemetic, analgesic, anti-inflammatory and antiviral properties.

Gingerenone A, gingerol, geraniol, shogaol, zingiberene, zingiberenol, and zingerone compounds from ginger interact with spike and main protease of SARS-CoV-2 and, thus showed anti-SARS-CoV-2 properties (Agrahari *et al.*, 2015; Aboubakr *et al.*, 2016 ; Yashin, 2017; Admas, 2020 ; Akham *et al.*, 2020).

3.3 Cinnanon (*Cinnamomum cassia*)

Cinnanon possesses antimicrobial including antiviral, antioxidant, antihypertensive, antidiabetic properties. It is commonly used in fever, common cold, headache and throat infections. The bark of cinnamon contains 21 antimicrobial compounds, which include cinnamaldehyde (60.41%) and eugenol (3.19%).

Cinnamon increases the phagocytic index, serum immunoglobulin levels and titer of antibody at high dose (100 mg/kg) while in low dose (10 mg/kg), it increases the level of serum immunoglobulin. Thus, it increases both cellular and humoral immunity.

3.4 Clove (*Syzygium aromaticum*)

Clove is used as an antiseptic against due to its antimicrobial properties against oral bacteria. Clove is also used in the food industry due to its antimicrobial activities for increasing shelf-life. Use of clove as clove buds, clove oil, eugenol has been confirmed as safe by FDA. Daily uptake of clove in humans (2.5 mg/kg) has been considered acceptable in humans by WHO. Eugenol, a compound from clove shows antiviral properties by inhibiting replication of the virus and its infection.

3.5 Black pepper (*Piper nigrum*)

Black pepper has antipyretic, antiasthmatic, antioxidant, antimicrobial and anti-Alzheimer properties and has been widely used in Ayurveda, Siddha, Unani, and Tibetan system of medicine (Irshad *et al.*, 2017).

Piperine is the most important compound from it and has been found effective against Dengue and Ebola viruses. Whereas, piperanine and piperdardiine are thought to be effective against COVID-19.

4. Conclusion

From the above discussion, we can conclude that herbs and spices are not only the immunity booster, but they can inhibit the entry of the virus and even inhibit the replication of the SARS-CoV-2 also. Also, ashwagandha, giloy and tulsi could be used together as they could work in tandem. Moreover, both humoral and cellular immunity would get increased by the use of herbs and, spices and thus would be beneficial for the patient of COVID-19.

Conflict of interest

The authors declare no conflicts of interest relevant to this article.

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Citation

Sunil, Shweta Sharma, K.P. Kochhar and Suman Jain (2021). A scoping review on herbs and spices with special reference to COVID-19 pandemic. *Ann. Phytomed.*, Volume10, Special Issue2 (COVID-19): S125-S127. <http://dx.doi.org/10.54085/ap.covid19.2021.10.2.14>