Nutrition & Food Science
International Journal
ISSN 2474-767X

Juniper Publishers
key to the Researchers

Mini Review
Volume 11 Issue 2 - September 2021
DOI: 10.19080/NFSIJ.2021.11.555806

Nutri Food Sci Int J

Moringa and Spirulina: Mini Review on their use against COVID-19

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Submission: August 19, 2021; **Published:** September 02, 2021

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Abstract

The world woke up in 2020 with a new virus called coronavirus 2019 (COVID-19). The virus spread easily from Wuhan, a western province in China to the whole world and caused a pandemic situation. Some preventive measures such as wearing of face masks and the use of alcohol-based sanitizers have been prescribed by the World Health Organization (WHO). All these measures could not effectively handle the virus, and the world started to search for a new solution by using herbal medicines. This mini-review discusses the use of Moringa and spirulina to combat COVID-19.

Keywords: Moringa; Spirulina; covid-19; Herbal medicines

Introduction

Discovered in 1965 by Tyrrell and Bynoe, human coronaviruses are group of viruses that display crown like spikes on their surface [1]. There are several types of coronaviruses (four sub groups) in the world; namely alpha, beta, gamma and delta. Six of them including alpha coronaviruses (229E and NL63) [2,3], two types of beta coronaviruses (OC43 and HKU1) [3,4] were explored before 2019. These alpha-coronaviruses and the two types of beta-coronaviruses are common, but they do not cause severe biological damage in humans. Some of the coronaviruses can cause middle east respiratory syndrome called MERS-Cov [5, 6]. Another beta coronavirus was able to induce severe acute respiratory syndrome (SARS) and was labelled as SARS-Cov [5,6]. In 2019, a new form of SARS-Cov came out with a severe pandemic impact. The name SARS-Cov 2 or COVID-19 was given to this new virus [7]. The COVID-19 identified in Wuhan (a Western China province) had spread quickly to other parts of the world. This situation resulted in locking down the world and its economy, akin to the 2008 economic crunch. Some prevention methods like the use of alcoholic or gel-based sanitizers were firstly prescribed, and the use of face masks to prevent the spread of viruses in the air. These two methods could help protect against the viruses; however, they do not get rid of the spread completely. In the middle of 2020, the idea of developing a vaccine had emerged. Some pharmaceutical research industries investigated and came out with some vaccines, which have already been given out in many countries All these precautions do not rapidly eliminate the spread of the virus completely. Moreover, the virus keeps on mutating, and new variants have been identified, which are more dangerous than the earlier types (delta). In middle of this, the population in many parts of the world went back to explore nature by using herbal medicines that could potentially control the virus. Among these herbal medicines are Moringa oleifera and Spirulina, which have been used by some herbal practitioners to treat COVID-19. In this mini review we seek to discuss how this could happen for these two old nutraceutical medicines to help combat the virus amidst the pandemic.

Spirulina and Covid-19

Spirulina, a microalgae used as a diet worldwide is rich in protein, vitamin B1, Vitamin B2, vitamin B3, copper and iron [8]. It is an aquatic organism which needs the presence of salt and fresh water to grow by photosynthesis. It is well-known that spirulina is the best candidate for nutritional supplement for different disease such as cancer and HIV [9-13]. A lot of researchers have proven that spirulina can be used as an antioxidant and anti-inflammatory agent; it helps to lower bad cholesterol and triglyceride levels, thereby controlling type 2 diabetes [14,15]. Spirulina has been explored to reduce blood pressure and has been confirmed to be efficacious against anemia. With the presence of protein and vitamins, spirulina has been consumed to strengthen muscles and improve performance by endurance. Since the appearance of covid-19, there have been 7 research publications that have reported the consumption of spirulina for the control of this virus. Carbone et al., showed that by their antiviral activities, microalgae such as spirulina could help to boost immunity [16]. By the strength of their immunity, the person affected or a healthy person can control the virus, however, the authors did not define the quantity of spirulina to take. The mechanism by which spirulina can act as an antiviral agent was not well-established. In fact, all these research papers suggested that, spirulina may down regulate anti-inflammatory signal by the presence of phycocyanobilin in its components [17-20]. The stimulation of the immune system by increasing phagocytic activity of macrophage which are recruited to fight against the virus have also been reported by Ferreira et al., and Ratha et al., [21,22]. Tzachor et al. [23] had published original work which showed the different effects of spirulina against covid-19 is dependent on the type of spirulina. As was mentioned in the beginning, the growth of spirulina nutriment is photosynthesis-dependent. They compared the effect of solar and light-emitting diode (LED) on the photosynthesis of spirulina. They found that LED spirulina had more anti-inflammatory effect than solar spirulina due the presence of bioactive components like sorbitol, adenosine derivates and C-phycocyanin (CPC) [20]. After extraction, the authors stated that the amount of all these components were significantly increased by using LED as compared to solar [23]. Covid-19 has an acute inflammatory part, and as such by using spirulina, especially LED spirulina extract, it could interfere with tumor necrosis factor (TNFα), which might help to control the inflammatory aspect of covid-19 disease [23]. All these researches demonstrated the case and the importance of spirulina in the apprehension of covid-19 disease.

Moringa and Covid-19

Moringa oleifera, a plant widely used as a supplement nutrition is rich in vitamin C, potassium, calcium, protein, iron, and amino acid [24,25]. These nutrients are responsible for building of muscles after the consumption of M. oleifera. A lot of research reported that M. oleifera could act as antioxidant, immune system booster, lower blood pressure and reduce fat in blood and body [26]. Some research emphasized its use on rheumatoid arthritis, diabetes, cancer, and memory loss [27]. Hamza et al., by using molecular peptide docking proved the effect of M. oleifera on covid-19. They found the presence of flavonoid which may interact with 15 peptides of SARS Cov 2 and reduce the activity of the virus. Their findings revealed that the antiviral activity of M. oleifera is due to the presence of those flavonoids [28]. Moreover, Mathpal et al. [29] used computational approaches to screen the potential of the compounds in M. oleifera on SARS-Cov 2. Among 294 phytochemicals compounds of M. oleifera they found that two of them (Kaempfenol-3-o-rutinoside and vitexin) showed good stability and high binding to the SARS-CoV-2 receptors [29]. These compounds are also flavonoids, and further confirmed the findings by Hamza et al. [28]. Sen et al [30]., demonstrated that the antiviral activity of M. oleifera was dependent on the presence of three flavonoids in the plant. These three flavonoids are isorhamnetin, kaempferol and apigenin. They displayed good binding by virtual screening and dynamic simulations [30]. In addition, Muhammad et al. [31], confirmed the antiviral activity of M. oleifera on covid-19 by performing in silico molecular docking and dynamic studies. According to these authors, the presence of ellagic acid and apigenin is responsible for the antiviral activity of M. oleifera. They evaluated the pharmacokinetics and toxicology profiles of these compounds and revealed the safety of the plant. The molecular docking of these compounds showed clearly their druggability [31].

Shaji et al. [32] investigated the binding properties between covid-19 (the main protease (Mpro)) and several compounds of M. oleifera by performing protein-ligand docking. 12 compounds (morphine, kaempferol, quercetin, pterygospermin, benzoic acid, gallic acid, benzyl isothiocyanate, niazirin, niaziminin, niazinin, o-ethyl-carbamothionate and niazirinin) found in M. oleifera were evaluated. After docking, the result demonstrated that only niaziminin bound strongly to the Mpro, probably by it OH groups. Niaziminin could form hydrogen bonds with the sequences Glu 166 and Phe 140 of the Mpro of covid-19 [32]. This was confirmed by Ullah and Ullah, who also evaluated the binding of natural and synthetic inhibitors to Mpro as promising vaccine strategies against covid-19 [33]. Sundhari et al. [34] have also encapsulated M. oleifera in electrospum nanofiber and evaluated its effect on covid-19. The nanofibers were able to control the viruses' particles and they developed a new face mask to protect safe and sick people [34]. Usually, researchers assume that old medicines cannot work on new diseases. These two well used natural drugs showed promising efficacy against covid-19 [35,36]. This still confirmed that natural product work as combination strategies to enhance the activity of each component. This review encourages the use of these two products (spirulina and M. oleifera) to boost immunity of healthy people and re-boost the immunity of sick people under this covid-19 pandemic. Further research may help

How to cite this article: Assogba G A, Yaw O D, Janvier E A, Ahokanou F G, Habib G. Moringa and Spirulina: Mini Review on their use against COVID-19. Nutri Food Sci Int J. 2021. 11(2): 555806. DOI: 10.19080/NFSIJ.2021.11.555806

to investigate the combination of spirulina and M. oleifera on covid-19.

Conclusion

The promotion of the consumption of these two herbal medicines is welcome to combat the Covid-19. By interacting with the receptor of this virus, Moringa and spirulina helps to control the inflammation part of the covid-19. These two products can boost the immunity of healthy and sick patients, thereby giving a protection against covid-19. These products might be used by the world population in this pandemic situation. Further research needs to be conducted to evaluate the impact of this combination.

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