

Inclination toward herbal remedies as immunity boosters and anti-stress agents during COVID-19 pandemic: A short report

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WEBSITE: ijhs.org.sa
ISSN: 1658-3639
PUBLISHER: Qassim University

COVID-19 pandemic is a global public health disaster and an inducer of physiological stress and fear. Population in every society all over the globe is severely affected directly or indirectly by this pandemic that has created huge stress that will persist in memories for long.^[1,2] As we know that the stress is a leading psychopathological cause responsible for the onset of several neurodegenerative disorders, particularly Alzheimer's, Parkinson's, etc., and it has now been speculated that nearly two-thirds of the clinical ailments are either induced or exacerbated by physiological stress.^[3,4] It is now well established that the physiological and psychological responses to stress are mediated by the hypothalamic-pituitary-adrenal (HPA) axis, sympathoadrenergic and brain monoaminergic systems,^[5,6] and most importantly an altered function of HPA-axis was recently reported in patients with COVID-19,^[7,8] this is somewhat indicating that stress might be involved in the progression of this ongoing pandemic. It has now been well established that the dysfunctionalities of central neurotransmitters such as noradrenaline, dopamine, and 5-hydroxytryptamine are involved in the onset or progression of several stress-mediated neurodegenerative disorders.^[9,10] Similarly, dysfunctionalities of these neurotransmitters in COVID-19 patients have also been recently reported,^[7,11,12] indicating that stress may play a role in the progression of this pandemic. Moreover, it is also reported that the dysfunctions of neurotransmitters due to prolonged stressful conditions have also been associated with wide range of central and/or peripheral disorders such as depression, anxiety, drug abuse, obsessive compulsive disorder, eating and sleeping disorders, hyperglycemia, and decreased immune response,^[13,14] these symptomatic neurological problems have also been reported in thousands of COVID-19 patients.^[15-17] In view of these, it is somewhat clear that physiological stress and COVID-19 have some associated with each other but further investigations at molecular levels are recommended.

Herbal remedies are plants used like a medicine. Global populations are using herbal remedies as an alternative medicine

to help, prevent, or cure disease for getting relief from symptoms, boost energy, relax, and it is believed that these remedies are not having any side effects.^[18,19] Numerous herbal plants and their active ingredients have been tested on different disease models and were proved to have anti-disease activities.^[20-22] Similarly, several herbal plant extracts or their purified fractions have been tested at molecular level and proved to have anti-stress activities through improving the levels of neurotransmitters and have also been used as immunity boosters.^[23] Some examples of herbal medicinal plants have been debated in this article. *Bacopa monniera* (also known as brahmi) has been reported to possess anxiolytic, antidepressant, neuroprotective activities, and memory-enhancing activity.^[24] Another herbal plant *Panax quinquefolium* also showed neuroprotective potential against neurological stress and also exerted anti-anxiety effects.^[25] Most importantly, *Panax ginseng* applications are also reported to have antiviral effects and also work as immunity booster.^[26] Moreover, application of *Panax ginseng* also reported to prevent the onset of acute respiratory tract infection.^[27] Another herbal plant, *Withania somnifera* (also known as ashwagandha) reported to have potential in reducing the levels of anxiety, stress, and helping the individuals to fight against depression and improve the brain functions.^[28] Moreover, another medical plant *Ocimum sanctum* (or tulsi) popular for its multiple therapeutic potentials including antimicrobial and anti-stress agent and an immunity booster.^[29,30] *Ocimum sanctum* has also been shown to counter metabolic stress through normalization of blood glucose, blood pressure, and lipid levels and also proved to improve memory/cognitive functions through its anxiolytic and antidepressant properties.^[29] In addition, *Ocimum sanctum* also reported to improve the levels of the central monoaminergic, antioxidant systems disturbances and also reported to act as potential agent in the treatment of early/mild flu.^[29,30] Interestingly, active phytoconstituents of herbal plants *Withania somnifera*, *Tinospora cordifolia*, and *Ocimum sanctum* predicted to significantly hinder main protease of coronavirus severe acute respiratory syndrome coronavirus-2 through molecular

docking and molecular dynamic simulation,^[31] indicating that these herbal remedies were anticipated to impede the activity of the coronavirus. Other than these, *Zingiber officinale* (commonly known as ginger) has also been in use for several medicinal purposes because of its rich nutritional properties.^[32] The presence of gingerol makes ginger a perfect immunity booster and an antiviral agent that help us to fight against several infectious diseases.^[32] Not only have these, *Nigella sativa* (or black seed) also reported to have anti-stress potential and also known to work as an immunity booster in several pathological conditions.^[33] Recent reports have shown that the people from all over the globe are extensively using herbal remedies as an alternative medicine to fight against the ongoing pandemic as the treatment options are limited.^[34-36] Now, it is believed that the usage of herbal remedies in current conditions giving huge strength and ability to develop immunity, psychologically that surely plays a role against pandemic positively. In short, supplementing with herbal remedies is an easy, safe, and effective way to improve health and quality of life in this ongoing pandemic.

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