

# Potential of millet as an immune booster to fight against COVID-19

Millet is a type of cereals that are consumed worldwide due to its immense nutritional content. It has gained the researcher's utmost focus due to its significant functional roles in combating several ailments. It has already been established that millet is a rich source of bioactive content, micronutrients, fibers, vitamins that make it suitable for overall nutritional needs. Due to its constituent's pharmacological activities, it can be used for health management.<sup>[1]</sup>

At present, the world is facing a considerable health risk due to one of the most deadly strains of the virus that caused the COVID-19 disease. This ongoing COVID-19 situation has been confirmed as a global public health emergency by the World Health Organization.<sup>[2]</sup> It generally affect humans and targeting the respiratory system severely. In December 2019, a novel strain of coronavirus detected, which is mainly instigating severe pneumonia and finally mortality, reports concluded that it's genetically the same as earlier SARS-CoV, which had caused severe acute respiratory distress syndrome in 2002, so it named to be SARS-CoV-2. However, humans do not have immunity against this strain due to its novelty, and it cannot be eliminated naturally by the human immune system. It can generally affect older persons, who already have been facing concerns such as diabetes, cardiovascular disease, respiratory disorder, and hypertension; they don't have the immunity to cope with this as a suppressed immune system.<sup>[3]</sup> Diet and nutrition may be suggested for the mitigation of infections caused by the virus, including COVID-19. It has been stated that particular nutrients or their cocktails may improve the immune functions via stimulations of cells, signaling pathways modulations, and expression of the gene.<sup>[2]</sup> Millets have been reported for their immense source of zinc and iron compared to the other cereals crops. However, they contain the utmost concentration of proteins and vitamins.<sup>[4,5]</sup> Zinc is considered an essential micronutrient that is required to maintain the immune functions in the body. Previous reports have been confirmed that zinc supplementation may improve the rigorosity of bronchiolitis and pneumonia cases. Moreover, a systematic review has been validated that zinc supplementation considerably linked with reducing rates of pneumonia.<sup>[6,7]</sup> Peoples are more at risk of COVID-19 infections who have low immunity than those with better immunity.<sup>[8]</sup> Immunity or immune functions can be strengthened by taking an adequate amount of micronutrients such as iron, zinc, Vitamin A, Vitamin B6, Vitamin B12, and Vitamin E.<sup>[2,3]</sup> The virus commonly forms proteins molecules that have harmful actions on the host body. It has been stated that flavonoids are attached to these proteins' active sites and hinder protein molecule activity to neutralize the virus actions.<sup>[9]</sup> Moreover, millets comprise numerous flavonoids that have been reported as active anti-viral agents. In a computational study, the main protease (M<sup>pro</sup>) of SARS-CoV-2 was docked with millet-derived flavonoids (eleven), i.e., myricetin, tricetin, isovitexin, orientin, luteolin, daidzein, catechin, isoorientin, meletin, apigenin, and vitexin, besides two reference drugs. The

present study confirmed that apigenin may be recommended as a possible inhibitor of (M<sup>pro</sup>) SARS-CoV-2, based on the result of high binding affinities and positive absorption, distribution, metabolism, excretion, and toxicity properties. Hence, millets consumption may be suggested as an immune system booster that can be eventually effective to COVID-19.<sup>[10]</sup>

Millets are the most important and highly consumed food in the world. It is proven by the previous studies that essential vitamins and trace components such as zinc (Zn), copper (Cu), and selenium can support immunity.<sup>[3,11]</sup> The latest blog reported that in COVID-19 situations, again millet appears to be in demand due to its constituents' immune booster biological activities. It can perform several body functions that can improve the immune system against contagions.<sup>[12]</sup>

The scientists and doctors are also endorsing that taking a reasonable quantity of millet, people would improve their immune functioning, helping them to fight with the novel coronavirus infection. However, several foods are also known to be enhancers of immune responses. Besides, millet is a staple cereal and may be useful in such kind of pandemic situation (COVID-19) due to the nutritional properties that make it "Nutri-cereals."<sup>[13]</sup>

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## Conflicts of interest

There are no conflicts of interest.

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