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Received: 18 August, 2022

Accepted: 08 September, 2022

Published: 20 September, 2022

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CITATION

Demir E, Pharmacological studies of sumac plant on
COVID-19. Atlantic J Med Sci Res. 2022;2(4):69-71. DOI:
10.55358/atjmed.2022.08.015

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Pharmacological studies of sumac plant on COVID-19

Abstract

Since 2019, the COVID-19 virus has caused severe lung damage and acute respiratory syndrome, leading to global epidemics with high morbidity and mortality. The world health organization has declared it a cause of the pandemic. At the beginning of 2020, many national and international organizations urgently took action to develop vaccines, and dozens of approved vaccines have been developed so far. Despite the significant effectiveness of vaccines, the continuation of deaths because of COVID-19 has increased people's interest in traditional medicine.

The uncertainty in the diagnosis, prevention, and treatment of many diseases, especially chronic diseases, has increased the interest in treatment methods other than modern medicine all over the world. It is stated that over 85% of the population in Africa, Asia, and the Middle East use herbal medicines as the first treatment option. Some compounds are obtained from plants, especially flavonoids; the quercetin, silymarin, polyphenolic compound glycyrrhizin, and curcumin have shown antiviral activity.

Sumac is the common name for a genus (*Rhus*) in the Anacardiaceae family that includes over 250 species of flowering plants. Many compounds such as fatty acids, phenolics, organic acids, essential oils, proteins, fibers, vitamins, and minerals have been isolated from different parts of the sumac plant. It is considered a reasonable treatment in traditional medicine because of its analgesic, anorexic, anti-diarrheal, antiseptic, and antihyperglycemic properties. Djakpo and Yao reported that sumac contains potent antiviral properties. The bioactive compound of sumac with antiviral activity is polyphenol tetra-O-galloyl- β -D-glucose (TGG), a tannin. Ling et al. found that TGG exhibited significant inhibition against severe acute respiratory syndrome coronavirus (SARS-CoV). Sherif et al. identified six polyphenolic compounds of *Rhus* spp as potential inhibitors to the SARS-CoV-2 major protease enzyme (Mpro; 6LU7).

Keywords: Sumac, COVID-19, traditional medicine

INTRODUCTION

Since 2019, the virus that causes COVID-19 disease has caused severe lung damage and acute respiratory syndrome, causing global epidemics with high morbidity and mortality, and the world health organization has declared it a cause of the pandemic. Since the first reports of COVID-19, the infection has spread worldwide to include millions of confirmed cases (1-3). Since SARS-CoV-2 is a new pathogen, there was no effective specific antiviral therapy at first; therefore, various drugs such as lopinavir/ritonavir, neuraminidase inhibitors, and other available antiviral drugs have been proposed to treat COVID-19 infection (4). The size and severity of the condition and the lack of specific

therapy for the virus have led to a focus on research to find new therapeutic agents. In early 2020, many national and international organizations urgently took action to develop vaccines, and dozens of approved vaccines have been developed so far (5). Despite the antiviral treatments applied initially and the vaccines significantly effective, the continuation of deaths because of COVID-19 keeps people's interest in traditional medicine alive. The uncertainty in the diagnosis, prevention, and treatment of many diseases, especially chronic diseases, has increased the interest in treatment methods other than modern medicine all over the world. It is stated that over 85% of the population in Africa, Asia, and the Middle East use herbal medicines as the first treatment option (6). Some compounds are obtained

from plants, especially flavonoids; the quercetin, silymarin, polyphenolic compound glycyrrhizin, and curcumin have shown antiviral activity. Herbs known in ethnopharmacology have been proposed as antiviral agents for the treatment and control of infectious diseases such as COVID-19 (7,8).

Sumac

Morphologically, sumac is a perennial plant as shrubs with a height of 1-3 m (9). Sumac is the common name of a genus (*Rhus*) that includes over 250 species of flowering plants in the Anacardiaceae family (10). Our country is the gene center of sumac (*Rhus coriaria* L.), which is widely grown, especially in Eastern and Southeastern Anatolia (9). Sumac, which is used as a spice in the Middle East, is widely consumed alongside kebabs and grilled meats (11). It is traditionally used by North American Indians to treat bacterial diseases such as syphilis, gonorrhea, gangrene, and dysentery (12). In traditional Chinese medicine, all its parts have been used to treat diseases; for example, the leaves are used to treat diarrhea and inflammations; the root is used to treat jaundice and malaria; fruits and seeds are widely used in the treatment of dysentery and hepatitis (13). It is widely used as a medicinal plant, especially for skin problems and wound healing in Iran and Turkey (14). In traditional Arab and Palestinian herbal medicine, this herb is applied in the treatment of cancer, diarrhea, paralysis, dysentery, hypertension, ophthalmia, hematemesis, stomachache, diuresis, liver disease, diabetes, measles, atherosclerosis, headache, dental ailments, gum ailments, animal bites, dermatitis and smallpox (15,16). Many compounds, such as fatty acids, phenolics, organic acids, essential oils, proteins, fibers, vitamins, and minerals, have been isolated from different parts of the sumac plant (17). The most abundant organic acids in sumac are citric acid, malic acid, fumaric acid, and tartaric acid. The fatty components of sumac fruits are palmitic acid, oleic acid, myristic acid, stearic acid, palmitoleic acid, linoleic acid, and linolenic acid. Vitamin contents of sumac fruits are riboflavin, thiamine, pyridoxine, cyanocobalamin, biotin, nicotinamide, and ascorbic acid (11).

Pharmacological properties of sumac plant

Sumac can be considered an effective natural medicine because it has important pharmacological activities besides its many health benefits. Studies on sumac extracts have shown that it has analgesic, anorexic, antidiarrheal, antiseptic, antihyperglycemic, antifibrogenic, antimalarial, antifungal, anti-inflammatory, antimicrobial, antimutagenic, antioxidant, antithrombin, cytotoxic, hypoglycemic, leukopenic and antiviral effects (18-19)

Pharmacological effects of sumac plant on COVID-19

Djakpo and Yao reported that sumac contains potent antiviral properties (13). In studies, sumac's antiviral effects have been

reported that it has Anti-Human Immunodeficiency Virus -1 (HIV-1) (20), Anti Herpes Simplex Virus (HSV) (21), Anti Hepatitis C Virus (HCV), and anti-SARS-CoV activities (22). Tetra-O-galloyl- β -D-glucose (TGG) isolated from *Galla Chinensis* exhibited significant inhibition against severe acute respiratory syndrome coronavirus (SARS-CoV) (23). The bioactive compound of sumac with antiviral activity is the polyphenol TGG, a tannin (13). Indeed, Ling et al. discovered that TGG is effective against SARS-CoV with a mechanism to interfere with the entry of the virus into host cells (23). It has been stated that SARS-CoV-2 (COVID-19) belongs to the same beta coronavirus class as the previously known SARS-CoV and MERS-CoV, and they are similar in terms of the genome sequence, life cycle, mode of entry into a host, mode of transmission and clinical symptoms. Therefore, it has been stated that many herbs used in treating SARS-CoV will also be effective against COVID-19. Sherif et al. identified six polyphenolic compounds of *Rhus* spp. as potential inhibitors to the SARS-CoV-2 major protease enzyme (Mpro; 6LU7) (24).

CONCLUSION

Lopinavir/ritonavir, neuraminidase inhibitors, and other existing antiviral drugs were initially recommended for the COVID-19 disease, which has been spreading rapidly since 2019 and has high mortality and morbidity, and dozens of vaccines have been developed with further later studies. Despite the antiviral treatments and highly effective vaccines, the continuation of deaths because of COVID-19 has increased people's interest in traditional medicine. Besides sumac many health benefits, important pharmacological activities have brought to mind whether it may influence COVID-19 disease. Studies have shown that TGG, which is found in the sumac plant, known for its potent antiviral properties, may be effective on COVID-19 disease with its inhibitor effect.

Conflict of interests

The authors declare that there is no conflict of interest in the study.

Financial Disclosure

The authors declare that they have received no financial support for the study.

Ethical approval

Article type is a review article. Therefore, ethics committee is not required.

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