

A Mini-Review of the Medicinal Properties of Okra (*Abelmoschus esculentus* L.) and Potential Benefit against SARS-CoV-2

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Abstract

Indonesia is rich in medicinal plants, where its population has traditionally used them for generations to cure diseases. Traditional medicine and medicinal plants from Indonesia may lead to the discovery of novel drugs. *Abelmoschus esculentus* L. or okra is well known as a cure for several diseases and is included in various folk medicinal stockpiles. In recent decades, scientists have discovered the phytochemical composition in the whole okra plant, as well as its pharmacological activities. These studies established the therapeutic potential of okra for drug discovery. Therefore, the present review provides a sneak peek of okra's pharmacology and phytochemistry, also the potential benefit against SARS-CoV-2.

Keywords: *Abelmoschus esculentus* L., medicinal properties, SARS-CoV-2.

Introduction

Indonesia is encompassed by many vegetations, including tropical rain forests. Additionally, Indonesia is one of the top five countries in the world that has a high plant diversity, including approximately 6,000 medicinal plants¹. Consequently, Indonesia is rich in medicinal plants that is used by its population to cure many diseases^{2,3,4,5,6,7,8,9}. One of the medicinal plants in Indonesia is *Abelmoschus esculentus* L. or okra. Okra is also called qiu kui, bendi, lady's finger, gumbo, dharos, kacang, and bamieh. It is usually cultivated in warm temperate and tropical regions worldwide and belongs to the Malvaceae family¹⁰.

Okra is a medicinal plant due to the multiple benefits of its seeds, buds, stems, flowers, leaves, and pods in traditional and contemporary medicine¹¹. Okra fruits traditionally have been used as aphrodisiac, appetizer, cooling, and astringent agents. Other uses of okra include treatment of gonorrhea, bladder blockage, urinary

discharges, diarrhea, and chronic dysentery. Okra seeds have also been used as fungicide agents, anti-tumor, and anti-cancer¹². The pharmacological properties of okra, such as antioxidant¹³, anti-inflammatory¹⁴, immunomodulatory¹⁵, gastroprotective¹⁴, neuroprotective¹⁶, lipid-lowering¹⁷, anti-cancer¹⁸, anti-bacterial¹⁸, and anti-diabetic properties¹⁹ (Figure 1). Therefore, the present review provides a sneak peek view into okra's pharmacology and phytochemistry against SARS-CoV-2.

Okra Distribution

The okra plant grows annually up to 1 m. The plant prefers light (sandy), requires clay soils and well-drained moist soil. The plant prefers basic (alkaline), neutral, acidic soils, and it can grow in very alkaline soil. This plant cannot grow in the shade. The flowers are pollinated by bees and insects and are hermaphrodite (with both male and female organs). The flowers of the okra plant bloom approximately from June to October¹⁰.

Chemical Composition

The main components of okra bast fiber are lignin, hemicellulose, α -cellulose, and the rest are minor in

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proportion¹⁰. The chemical contexture of okra bast fibers, such as 2.7% aqueous extract, 3.9% fatty and waxy matter, 3.4% pectin matter, 7.1% lignin, 15.4% hemicellulose, and 67.5% α -cellulose^{2,4,5,8}.

Nutritional Potential of Okra

Ca, Mg, Na, and K are the important elements in okra pods, which contain approximately 17% seeds; the presence of Ni, Mn, Zn, and Fe has also been reported²⁰. A fresh okra pods are low in calories, no fat, high in fiber, and many precious nutrients, including approximately 10-20% folate (46-88 g), about 5% of vitamin A, approximately 30% of the recommended levels of vitamin C (16-29 mg), and both okra mesocarp and seeds are good sources of zinc (80 g/g)^{21, 22}. Flavonol derivatives (3.4 mg/g of seeds) and oligomeric catechins (2.5 mg/g of seeds) are importantly composed of okra seeds. On the other hand, the mesocarp is structured of quercetin derivatives and hydroxycinnamic acid, 0.3 and 0.2 mg/g of skins, respectively. Seeds and pods are composed in phenolic compounds with notable biological properties such as hydroxycinnamic derivatives, catechin oligomers, and quercetin derivatives²³. These components, along with the high content of glycoproteins, proteins, carbohydrates, and other dietary elements, enhance the importance in the human diet^{24,23}. On the other hand, a dried okra sauce does not provide any vitamin A or retinol²⁵. However, fresh okra pods, an important dietary component to lower cholesterol, are the most notable vegetable source of fiber. In addition, seven-day-old fresh okra pods have the highest concentration of nutrients²⁶.

Okra's Benefits for Human Health

Okra is useful for minimizing blood sugar levels, and therefore beneficial in diabetes, owing to the fiber content, along with other nutritional components. Okra contains high fiber and helps to stabilize blood sugar levels by regulating the rate at which sugar is absorbed. Previous studies have reported that okra polysaccharide possesses hypoglycemic activity and anti-complementary in normal mice⁸. Additionally, okra can be used in kidney disease prevention¹⁷.

The okra pods are high in beta-carotene and vitamin A, which are important for healthy skin and sustaining eyesight. Okra is used to rectify eyesight. Additionally, these types of nutrients also assist in inhibiting skin related problems and eye-associated diseases²⁶.

The soluble fiber within okra helps to reduce serum cholesterol. Okra is also loaded with pectin, which can help in reducing high blood cholesterol. Consuming okra is an efficient method for managing the body's cholesterol level. Okra used to improve heart health²⁷.

Okra is a good vegetable for those exhausted and feeling weak. Okra is also used in asthma, irritable bowel lung inflammation, ulcers, and sore throat²⁶.

Okra used to treat many digestive system problems. Okra is used to support colon health. The polysaccharides present in okra pods suggested that they help to erase the adhesive between stomach tissue and bacteria, preventing bacteremia. Okra's polysaccharides are effective at inhibiting the adhesion of *Helicobacter pylori*. Therefore, okra can create an environment that prevents destructive cultures from flourishing and cleanse our stomach. Okra smoothly moves down the colon, excess water in its path and absorbing toxins²⁷.

Mucilage are very rich in okra roots and have a sturdily demulcent action. This mucilage can be used as a plasma replacement. The roots infusion is used in the medication of syphilis. In Nepal, the juice of the roots is used to treat boils, wounds, and cuts. In addition, the leaves furnish an emollient poultice. Then, a decoction of the immature capsules is used as diuretic, emollient, and demulcent. It is used in the medication of dysuria, gonorrhoea, and catarrhal infections. The seeds of okra have stimulant properties and anti-spasmodic. On the other hand, infusion of the okra roasted seeds also has specific properties¹⁰. Based on these numerous beneficial properties, okra may be a viable candidate against the SARS-CoV-2, but we need many confirmatory studies such as *in silico*, *in vitro*, and *in vivo* (Figure 1).

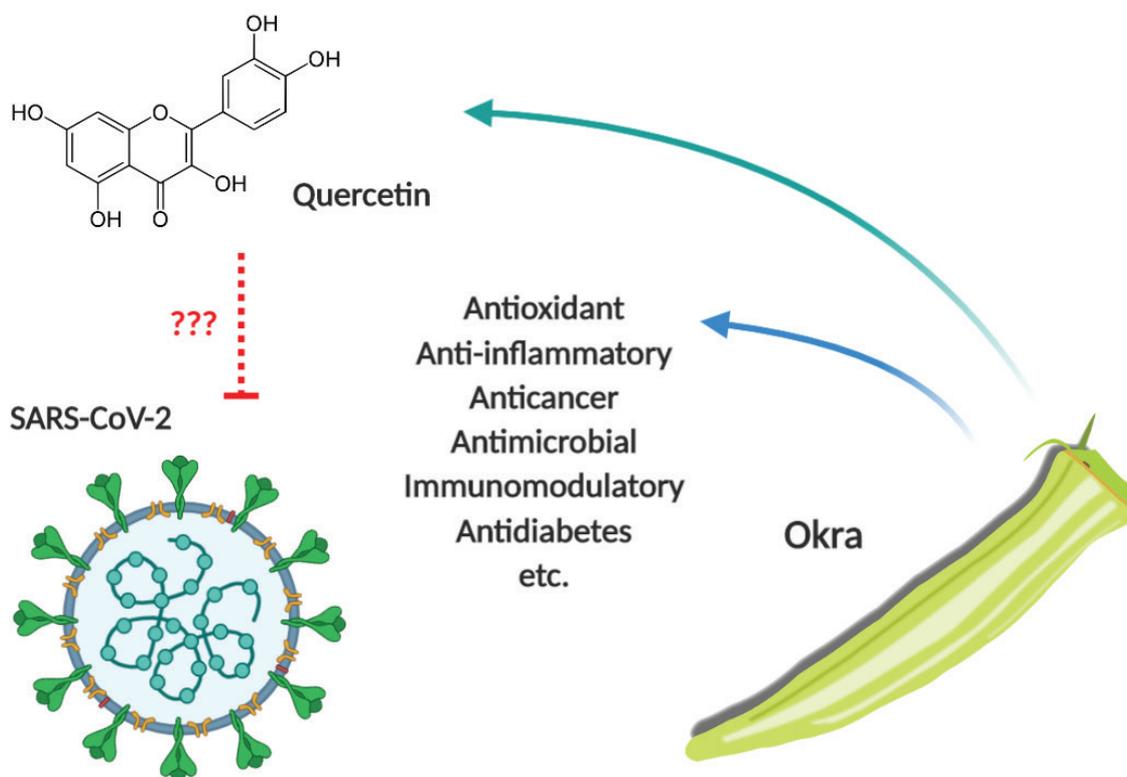


Figure 1. The okra fruits and its phytomedicine benefits. This figure edited using BioRender.

Medicinal plants for a forthcoming cannot bring any cognizance for any antagonistic effects from the utilize of plants. In addition, always seek recommendation from professionals before using a plant medicinally for any of its properties including vulnerary, stimulant, emollient, diuretic, diaphoretic, demulcent, and antispasmodic properties.

Conclusion

In summary, prior potency and scientific reports of the medicinal properties of okra identify it as a valuable plant and establish it as a candidate for future development of drugs against SARS-CoV-2.

Conflict of Interest: The author declare that they have no conflict of interest.

Source of Funding : This study supported by the PMDSU Scholarship (Batch III) from the Ministry of Education and Culture of the Republic of Indonesia.

Acknowledgements : We thank Editage for editing the manuscript. We would like to declare our sympathy to the victims of COVID-19. Tribute goes to the frontliners worldwide, especially in Indonesia.

Ethical Approval: No ethical approval needed.

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