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Mini Review

Evaluation of medicinal and nutritional effectiveness of abelmoschus esculentus L

Hülya Çiçek, Hanım Seval Kaya, Mustafa Kiliç, Abdüssamed Yazgan

Gaziantep University, School of Medicine, Medical Biochemistry Department, Şahinbey-Gaziantep, Turkey.

Corresponding author: Hülya Çiçek, Gaziantep University, School of Medicine, Medical Biochemistry Department, Şahinbey-Gaziantep, Turkey.

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Abstract:

Plants that have been used under the name of traditional treatment for many years have been supported by recent studies. We use plant species as bioactive phytochemicals in many areas of our lives. In addition to being used in cosmetics, food, medical, and industrial applications, it is a potential product for preventing diseases with the compounds found in its structures. Okra (Abelmoschus esculentus L.) with its bioavailability and phytochemical compounds has an important place among such plants.

Okra is a vegetable plant that grows in tropical and subtropical environments and belongs to the family Malvaceae. Okra, which is thought to be of African origin, is an edematous plant, especially for Pakistan and India. Okra has various uses with its seed, flower, leaf, bark, and stem parts. It is mostly used as a fresh and green soft vegetable. The edible parts are rich in carbohydrates, protein, fatty acids, fiber, vitamins, and minerals. Due to these compositions, it plays a vital role in human nutrition. Okra seeds are a potential source of oil with concentrations between 20% and 40% decoctions, containing up to 47.4% linoleic acid. Its seeds are rich in linoleic acid. It is also known to be rich in high-quality protein in terms of essential amino acid content. The soft and edible parts become mucilaginous after cooking. Carbohydrates are usually found in the form of mucilage.

In recent years, more attention has been paid to the use of metabolites found and obtained in some parts of plants, such as seeds, leaves, and bark, in medical fields and their effects on human health. The different parts of the okra plant (mucilage, seeds, and pods) contain some important bioactive components that give it its medicinal properties. These bioactive components of okra have been studied for their potential effects on various chronic diseases such as type 2 diabetes, cancer, and cardiovascular and digestive system diseases, as well as their anti-fatigue, liver detoxification, and antibacterial activities under the influence of polyphenols, which allow it to have antioxidant properties in its content.

In general, okra is recognized as an important food product with various nutritional values and potential health benefits, easy to procure, and low cost.

Key words: abelmoschus esculentus l; biochemical composition; health benefits; medicine

Introduction

Okra (Abelmoschus esculentus L.), belonging to the Malvaceae family [1] is an economically important plant species grown in tropical and sub-tropical regions of the world [2]. Okra is an important vegetable product in Pakistan, India, West Africa, South East, Asia, the USA, Brazil, Australia, and Turkey [3]. It is grown mostly in the Central Black Sea region in our country [4]. However, its main homeland is Ethiopia, Sudan, and Northeast African countries [5]. It is one of the oldest cultivated plants and is still cultivated in many countries and has spread over a wide area from Africa to Asia, Southern Europe, and America. It is sensitive to frost; low temperature, flooding, and drought conditions, and from different countries have certain adapted distinctive characteristics specific to the country to which they belong [6]. Okra is a multi-purpose product due to the various uses of its fresh leaves, buds, flowers, pods, stems, and seeds [2]. However, it is usually consumed as a vegetable in various forms for its green soft fruits [6].

Figure 1: Okra Plant [5]

Okra, known as lady's finger (Abelmoschus esculentus L. Moench), can be used in salads, soups, stews, or as a fried or boiled vegetable [7]. After cooking, it gets a mucilaginous consistency [2].

While fruit serves as a delicious product in kitchens, mucilage can be used as a renewable source of biodegradable materials due to its plasticity, high solubility in water, viscosity, and elasticity [8].

Okra is a multi-purpose product that is valued for its medicinal and nutritional contribution to human health. Okra fruits have a large number of bioactive compounds, such as carotene, polyphenolic, folic acid, riboflavin, niacin, vitamin C, and thiamine [9].

Okra is an important vegetable product with a wide range of nutritional quality and potential health benefits.

Nutrient Composition of Okra

Okra plays a vital role in human nutrition due to the fat, protein, carbohydrates, and vitamin C contained in its composition separately from the basic foodstuff.

Okra seeds are a potential source of oil containing up to 47.4% linoleic acid, with concentrations ranging from 2 to 40%. Okra seed oil is also a rich source of linoleic acid, a polyunsaturated fatty acid necessary for human nutrition [10].

It is known that ripe okra seeds are a good source of fat and protein and have superior nutritional quality [6]. The amino acid composition of its protein is comparable to that of soybeans, and its protein efficiency ratio is higher than that of soybeans, and the amino acid model of the protein makes it an adequate supplement for legume-based or grain-based diets. It is known that okra seed is rich in high-quality protein, especially in terms of essential amino acid content compared to other vegetable protein sources [2].

Carbohydrates are mostly found in the form of mucilage. The mucilage in young fruits consists of long-chain molecules with a molecular weight of about 170,000, consisting of sugar units and amino acids. The main components are galactose (25%), rhamnose (22%), galacturonic acid (27%) and amino acids (11%). Mucilage is highly soluble in water. Its solution in water has an intrinsic viscosity value of about 30% [11]. In addition, the mucilage of okra binds cholesterol and bile acid, which carry toxins excreted by the liver [10].

When freshly cooked at the edible stage, soft broad beans contain about 88 ml of water, 2.1 g of protein, 0.2 g of fat, 8 g of carbohydrates, 36 calories, 1.7 g of fiber, 175 mg of minerals, and 232.72 mg of vitamins per 100 g of edible portion. People also eat young and soft okra leaves. The edible leaf portion contains about 1 ml of water per 100 g, 4.4 g of protein, 0.6 g of fat, 11 g of carbohydrates, 56 calories, 2.1 g of fiber, 602.7 mg of minerals, and 44 7.25 mg of vitamins [12].

Parts of okra are powerhouse of soluble fibers in the form of pectin, which helps to lower serum cholesterol and reduces the risk of heart diseases. The other part is insoluble fiber, which helps to keep the intestinal tract healthy [10].

Okra is rich in phenolic compounds, which are divided into four and have important biological properties, such as flavonol derivatives, catechin oligomers, and hydroxycinnamic derivatives [2]. This vegetable provides an important vitamin and mineral salt input, including calcium, which is often lacking in the diets of developing countries [3]. Okra is also known for its high antioxidant activity [2].

Generally speaking, okra mucilage is suitable for industrial and medical applications. Industrially, okra mucilage is often used for the production of glase paper, and there is also a confectionery use. Okra mucilage has medical applications when used as a plasma replacement or blood volume expander [11, 12].

The Benefits of Okra for Human Health

In recent years, more attention has been paid to the use of metabolites found and obtained in some parts of plants, such as seeds, leaves, and bark, in medical fields and their effects on human health. Okra, one of these products with its edible parts, is used as a natural functional foodstuff.

The different parts of okra (mucilage, seeds, and pods) contain some important bioactive components that give it its medicinal properties. The phytochemicals of okra have been studied in terms of their potential therapeutic activities on various chronic diseases such as type 2 diabetes, and cardiovascular and digestive diseases, as well as its anti-fatigue effect, liver detoxification, antibacterial and chemo-preventive activities [13]. Studying the biological factors of okra plants at the cellular level is effective in preventing diseases [14]. In particular, the mucilage of okra has a valuable importance in terms of evaluating this vegetable as a potential functional food. Okra mucilage can be consumed as natural and can be considered a natural functional food in itself due to its potential health benefits [15].

Okra mucilage is a natural polysaccharide consisting mostly of the monosaccharides D-galactose, L-rhamnose, and galacturonic acid, as well as proteins and minerals [16]. The nutrients, phyto-components, minerals, Zn bioavailability, and antioxidant properties of the mucilage obtained from okra are higher than the whole okra. The mucilage of this vegetable can prevent protein deficiency and act as a natural antioxidant [17]. Okra mucilage has shown functional health properties such as antitumor, antioxidant, antimicrobial, hypoglycemic, and antiulcerogenic capacities, as well as the ability to remove toxins from the liver by binding cholesterol and bile acids, especially through in vitro and in vivo studies [15].

Flavonoids contained in okra seed compositions are plant-derived dietary components that have a significant impact on human health. Research has expanded greatly since it began in the 1930s. The disagreements about the bioavailability of flavonoids in the human body have become very clear. In recent years, it has been observed that the gut microbiome plays an important role in flavonoid action [18]. In a study conducted in vivo and in vitro on okra seeds and shells, the content of total polyphenols and total polysaccharides was found to be 29.5% and 14.8% in seeds and 1.25% and 43.1% in shells, respectively. The total flavonoids, isoquercitrin, and quercetin-3-O-gentiobiose (5.35%, 2.067%, and 2.741% respectively) have been detected only in seeds. According to biochemical markers, the anti-fatigue activity of okra seeds improves their antioxidant ability by reducing blood lactic acid (BLA) and urea nitrogen (BUN) levels, increasing hepatic glycogen storage, and reducing malondialdehyde (MDA) levels and increasing superoxide dismutase (SOD) and glutathione peroxidase (GSH-PX) levels. These results prove that okra seeds are the anti-fatigue part, and polyphenols and flavonoids are the active ingredients [19].

The functional properties of okra mucilage significantly induced cholesterol regulation has been widely studied; therefore, it may have the potential to be used as "heart friendly" [20].

Cancer is a disease that is the second cause of death in the world. Despite the developing technology, early diagnosis, and medicines, people also attach importance to plant-based medicines. Many studies indicate that the biological components in herbal products partially stop the progression of cancer and its negative effects. Increasing these studies will reduce the complexity of cancer treatment and prevention. Many studies have also been reported on the effects of parts of the okra plant on cancer.

A study has been reported that examines the effect of AFE on colorectal cancer (CRC) cell growth in vitro and in vivo by extracting and purifying flavonoids from okra flower (AFE). In this study, it was determined that AFE is a safe, natural antioxidant and exerts a significant antitumor activity on the inhibition of CRC cell proliferation and metastasis, as well as tumor growth in vivo. It also reveals that AFE inhibits CRC cell proliferation and autophagic degradation by inducing mitochondrial dysfunction caused by the activation of p53 and the induction of apoptosis and senescence [21].

Several previous studies have reported that Abelmoschus esculentus (Okra fruit) has a hypoglycemic effect [22]. It shows that various parts of okra are effective in controlling blood sugar levels and improving lipid profile and have potential in the development of Okra-based antidiabetic nutraceuticals [23]. Therefore, the use of okra mucilage as a nutraceutical therapy or adjuvant therapy in the treatment of this disease is quite promising [24]. In addition, seed and shell extracts from okra plants studied in vitro have been shown to inhibit α-glucosidase and α-amylase activities. Therefore, the study does not confirm the hypoglycemic effect [25]. In general, the studies conducted provide a new perspective on the structure-activity relationships of the polysaccharide in okra and give impetus to the development of polysaccharide-based therapeutics against diabetes [26].

Okra, Abelmoschus esculentus (L.) (Malvaceae) is a medicinal plant that is widely used in traditional Turkish medicine for the treatment of various diseases, such as ulcers and gastritis. An in vivo study on stomach ulcers shows that okra has strong gastroprotective effects against stomach ulcers caused by ethanol. Okra has reduced stomach injuries, lipid peroxidation, ulcerated areas, edema, bleeding, cell infiltration, and epithelial cell loss and improves antioxidant defense systems. It is suggested that okra may be a useful therapeutic antiulcer agent [27].

In general, okra is an easily available, low-cost food product with various nutritional values and potential health benefits.

Conclusion

Generally speaking, this review highlights the potential effects of edible okra portions on different nutritional values and health benefits. Okra contains a significant amount of carbohydrates, proteins, fats, vitamins, minerals, and fiber. Besides these, it is an easily available and cost-effective natural product containing various other bioactive phytochemicals that are important for human health. The medicinal use of okra and its positive effects on diseases are observed. Therefore, more research needs to be done in terms of its pharmacological effect and mechanisms of action on many chronic diseases. The studies to be conducted on okra should focus on the development of functional nutrients and drugs for human health from okra components.

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