

## A REVIEW ON: A PHARMACOLOGICAL PROPERTIES OF ABELMOSCHUS ESCULENTUS

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### ABSTRACT

Abelmoschus esculentus L. is commonly known as lady's fingers, bhindi, okra or gumbo, is a flowering plant belongs to family Malvaceae. Okra is a multipurpose crop due to its various uses of the fresh leaves, buds, flowers, pods, stems and seeds. Okra mucilage has medicinal applications when used as a plasma replacement or blood volume expander. Okra is a popular health food due to its high fiber, vitamin C, and folate content. It is also a good source of calcium and potassium.<sup>2</sup> Greenish-yellow edible okra oil is pressed from okra seeds has a pleasant taste and odor, and is high in unsaturated fats such as oleic acid and linoleic acid.<sup>3</sup> In addition, the plant has been used medicinally in treatment of several disorders like Anti-cancer, antimicrobial, hypoglycaemic and anti-ulcer activity<sup>5-7</sup> etc. Overall,

Okra is an important vegetable crop with a diverse array of nutritional quality and potential health benefits. It is also known for being high in antioxidants. The aim of present study is to highlight the Pharmacognostical, phytochemical and toxicological investigation and nutritional health of the plant and its constituents.

**KEYWORDS:** *Abelmoschus esculentus* (L) okra, nutritional, quality, health, edible, Antioxidant activity and Phytochemical.

### INTRODUCTION

Medicinal plants play vital role in the discovery and development of natural antioxidants with improved efficacy and lower toxicity over synthetic agents. Thus, the Natural antioxidant are

always found cost effective and safe. Various medicinal plants as Natural antioxidant have already been reported in ethnomedical literature.<sup>[1]</sup> Phytochemicals which are secondary metabolites of plants viz tannins, alkaloids, carbohydrates, terpenoids, steroids, flavonoids and phenols are responsible for their bioactivities such as antimicrobial, antidiabetic and antioxidant.<sup>[2][3][4]</sup> etc. *Abelmoschus esculentus* is a flowering plant commonly known as 'Bhindi' in Hindi, belongs to the family Malvaceae, valued for its edible fruits and therapeutic importance.<sup>[5]</sup> *Abelmoschus esculentus* L. is commonly known as lady's fingers, bhindi, okra or gumbo, is a flowering plant belongs to family Malvaceae. It is valued for its edible green seed pods. The geographical origin of okra is disputed, with supporters of South Asian, Ethiopian and West African origins. The plant is cultivated in tropical, subtropical and warm temperate regions around the world.<sup>[6]</sup> Okra is a multipurpose crop due to its various uses of the fresh leaves, buds, flowers, pods, stems and seeds.<sup>[7]</sup> Okra immature fruits (green seed pods), which are consumed as vegetables, can be used in salads, soups and stews, fresh or dried, fried or boiled.<sup>[8]</sup> Okra mucilage has medicinal applications when used as a plasma replacement or blood volume expander. The mucilage of okra binds cholesterol and bile acid carrying toxins dumped into it by the liver. The immature pods are also used in making pickle. The entire plant is edible and is used to have several food.<sup>[9],[10]</sup>

Okra pods are considered nutritious, providing some human supplementary, vitamins such as vitamin C, A, Bcomplex, calcium, potassium, iron and other minerals.<sup>[11][12]</sup> Okra pod contains many nutritional contents which important for human health. One hundred gram of fresh pod has around; moisture (89.6 percent), K (103 mg), Ca (90 mg), Mg (43 mg), P (56 mg), vitamin C (18 mg) and some important metals such as iron and aluminium.<sup>[13]</sup> The application of plant growth regulators is known as one of the most effective treatments used now a days in agriculture, productivity of horticulture crop productions were increased by application of different growth regulators.<sup>[14]</sup> Regulators mainly regulate the plant physiological and biochemical processes. They play a major role in dormancy, organ size, crop improvement, flowering and fruit set, regulation of chemical composition of plants and control of mineral uptake from the soil.<sup>[15]</sup> Some of them are naturally occurring, organic substances that affect the plant growth when used at low concentrations and sometimes they act as inhibitors at high concentrations. There are some reports, which indicate that application of growth regulators improved the growth and yield of vegetables.

Okra is a popular health food due to its high fiber, vitamin C, and folate content. It is also a good source of calcium and potassium.<sup>[16]</sup> Greenish-yellow edible okra oil is pressed from okra seeds has a pleasant taste and odor, and is high in unsaturated fats such as oleic acid and linoleic acid.<sup>[17]</sup> In addition, the plant has been used medicinally in treatment of several disorders<sup>[18][19]</sup> like Anti-cancer, antimicrobial, hypoglycaemic and anti-ulcer activity<sup>[20][21]</sup> etc. It is also known for being high in antioxidants. The aim of present study is to highlight the Pharmacognostical, phytochemical and toxicological investigation of the plant and its constituents.

### Description

Biological name: *Hibiscus esculentus*, *Abelmoschus esculentus*.



**Fig 1: Okra.**

### Scientific classification

**Kingdom:** Plantae

**Division:** Magnoliophyta

**Class:** Magnoliopsida

**(Unranked):** Rosids

**Order:** Malvales

**Genus:** *Abelmoschus*

**Species:** *A. Esculentus*

**Binomial name:** *Abelmoschus esculentus*

**Other name of okra<sup>[22]</sup>**

India(Bhendi), Unitedstates(Okra), Caribbeans(Okro), China(Quiabo), Europe(Quiabo), Portuguese(Guigambo), Spanish(Gomobe), French(Gomobe).

**History**

Okra was first found in former Abyssinia (present Ethiopia), and was later distributed to the Caribbean, South America, North America, Africa, India, and Eastern Mediterranean. For the present moment, after its long-term glory in southern countries, okra is gaining popularity in the west.<sup>[23]</sup>

**Physical Characteristics**

Annual growing reaches to 1 meter. It is in flower from July to September. The flowers are hermaphrodite (have both male and female organs) and are pollinated by Bees and insects. The plant prefers light (sandy), medium (loamy) and heavy (clay) soils and requires well-drained soil. The plant prefers acid, neutral and basic (alkaline) soils and can grow in very alkaline soil. It cannot grow in the shade. It requires moist soil.

**Chemicals composition**

The chemical composition of okra bast fibre (*Abelmoschus esculentus* variety) are 67.5% a-cellulose, 15.4% hemicellulose, 7.1% lignin, 3.4% pectic matter, 3.9% fatty and waxy matter and 2.7% aqueous extract. It is clear that the main constituents of okara bast fibre are a-cellulose, hemicellulose, lignin and the rest or very minor in proportion.

1,1-Diphenyl-2-picrylhydrazyl (DPPH), Trichloroacetic acid (TCA), Nitro blue Tetrazolium (NBT), and Quercetin were purchased from Alfa Aesar Pvt. Ltd.. Nicotinamide adenine dinucleotide (NADH), Phenazonium Methosulphate (PMS), Folin-Ciocalteu reagent were purchased from Merck India Pvt Ltd. Sodium phosphate dibasic (Na<sub>2</sub>HPO<sub>4</sub>), Sodium phosphate monobasic (NaH<sub>2</sub> PO<sub>4</sub>) were purchased from Hi Media Laboratories and Potassium ferricyanide, Ascorbic acid, Sodium acetate, AlCl<sub>3</sub>, FeCl<sub>3</sub>.

In some countries, okra also is used in folk medicine as antiulcerogenic, gastroprotective, diuretic agents. In addition, Arapitsas reported that okra seed was rich in phenolic compounds, mainly composed of flavonol derivatives and oligomeric catechins, suggesting that it might possess some antioxidant properties.

### Okra dietary and nutritional values

Okra plays an important role in the human diet by supplying carbohydrate, minerals and vitamins. K, Na, Mg and Ca were found to be the principle elements, with Fe, Zn, Mn and Ni also present.<sup>[24]</sup> Okra seeds could serve as alternate rich sources of protein, fat, fiber and sugar.<sup>[25]</sup> The natural phenolic content of okra seeds has been reported.<sup>[26]</sup>

### Nutritional Value of Okra per 100gms<sup>[25]</sup> (Energy 33kcal)

Dietary fibre (3.3gm), carbohydrate(7.6gm),fat (0.1gm),protein(2.0gm),calcium(75mg), Magnesium(57mg), Potassium(299mg), vitamin A (669IU) vitamin C(23mg) vitamin (31mg)

### Pharmacological Investigation

Different extracts of fruit of the plant *Abelmoschus esculentus* (L) were screened for its anti-diabetic activity.

### Phytochemical properties

Phytochemical words came from Greek word *Phyto*—plant and chemicals. The term phytochemical is usually used to those chemicals that may have biological significance but are not established as important nutrients. But in narrower sense the term phytochemical describe the number of secondary metabolic compounds found in plants. The scientists estimate that approximately 10,000 different phytochemicals having the potential therapeutic effects on various ailments. Okra seed consists of tannins, terpenoids and glycosides.<sup>[26][27]</sup>

### Test for Steroids

The test extracts were treated with minimum quantity of chloroform, 3 to 4 drops of acetic anhydride and one drop of concentrated sulphuric acid. Purple color of the test content was changed into blue green. The result was qualitatively determined and recorded.

### Test for Reducing sugar

The test extracts were treated with 2ml of Fehling's reagent and 3ml of water. The test content was boiled and the development of red orange colour indicated the presence of reducing sugar.

### Test for Sugar

The test extracts were treated with minimum quantity of anthrone and a few drops of concentrated sulphuric acid and then heated. Change color from green to purple showed the presence of sugar.

**Test for Phenolic compounds**

The test extract in alcohol was treated with a drop of neutral ferric chloride. Change of intense colour in the test content, shows positive result for phenolic compounds.

**Test for Glycosides**

2 ml solution of the extract was taken into a test tube. 1 ml mixture of Fehling solution was added into the test tube. The tube was placed in a water-bath at 60 °C. If brick red color forms that shows the presence of glycosides.

**Test for Alkaloids**

In testing for Alkaloids, about 0.5g of extract will be stirred with 5 ml of 1 percent aqueous hydrochloric acid on a water bath; 1 ml of the filtrate is to be treated with a few drops of Mayer's reagent and a second 1 ml portion is to be treated the same way with Dragendorff's reagent. Presence of orange-red color indicates the presence of alkaloid.

**Test for Amino acids**

After treating extract with ninhydrin in alcohol. The violet colour formed confirmed the presence of amino acids.

**Test for Flavonoids**

A small quantity of test residue was dissolved in 5 ml of ethanol (95% v/v) and treated with few drops of concentrated hydrochloric acid and 0.5 g of magnesium metal. If the pink, crimson or magenta color is developed within a minute or two that means flavonoids are present.

**Test for Tannins**

About 5 g of each portion of plant extract will be stirred with 10 ml distilled water, filtered, and ferric chloride reagent will then be added to the filtrate. If dark green or deep blue color is obtained, it means tannins are present.

**Test for Saponins**

A few mg of the test residue was taken in a test tube and shaken vigorously with small amount of sodium bicarbonate and water. If stable, characteristic honeycomb like froth is obtained, it means saponins are present.<sup>[28]</sup>

### Terpenoids

Four mg of extract was treated with 0.5 ml of acetic anhydride and 0.5 ml of chloroform. Then concentrated solution of sulphuric acid was added slowly and red violet color was observed for terpenoid.

### Physicochemical Examination<sup>[29]</sup>

The qualitative physicochemical studies include parameters (Loss on drying, total ash, Acid insoluble ash).

### Toxicity studies

Toxicity studies were carried out according to the method of Knudsen and Curtis. The animals used in the toxicity studies were sanctioned by the Institute animal Ethics Committee. The male albino rats of Wistar strain weighing 160-200 gm were divided into different groups comprising of six animals each. The control group received normal saline 20 ml/kg i.p. The other groups received 500, 1000, 2000, 3000 and 4000 mg/kg of gum suspension in normal saline orally. The animals were observed continuously for the behavioural changes for the first 4 h.

### Antioxidant Assays - in vitro

Antioxidant study of *aqueous extract of Abelmoschus esculentus* leaves was carried out using various in vitro assays viz estimation of total phenolics, flavonoids and flavanols in addition to reducing power, and free radical scavenging capacity for DPPH, NO and superoxide anion radicals. All the assays were carried out in triplicate and their average values were taken into consideration.

### Medicinal uses

Plants for a future cannot take any responsibility for any adverse effects from the use of plants. Always seek advice from a professional before using a plant medicinally. Antispasmodic; Demulcent; Diaphoretic; Diuretic; Emollient; Stimulant; Vulnerary. The roots are very rich in mucilage, having a strongly demulcent action. They are said by some to be better than marsh mallow (*Althaea officinalis*). This mucilage can be used as a plasma replacement. An infusion of the roots is used in the treatment of syphilis. The juice of the roots is used externally in Nepal to treat cuts, wounds and boils. The leaves furnish an emollient poultice. A decoction of the immature capsules is demulcent, diuretic and emollient. It is used in the treatment of catarrhal infections, dysuria and gonorrhoea. The

seeds are antispasmodic, cordial and stimulant. An infusion of the roasted seeds has sudorific properties.<sup>[30]</sup>

### Other Uses

Fibre; Paper; A fibre obtained from the stems is used as a substitute for jute. It is also used in making paper and textiles. The fibres are about 2.4mm long. When used for paper the stems are harvested in late summer or autumn after the edible seedpods have been harvested, the leaves are removed and the stems are steamed until the fibres can be stripped off. The fibres are cooked for 2 hours with lye and then put in a ball mill for 3 hours. The paper is Cream coloured. A decoction of the root or of the seeds is used as a size for paper 21.Used for: Sylvia Zook, a qualified nutritional specialist, states that okra can favour one's body due to its properties.

Okra contains special fiber which takes sugar levels in blood under control, providing sugar quantity, acceptable for the bowels. Mucilage, found in okra, is responsible for washing away toxic substances and bad cholesterol, which loads the liver.

Purgative properties okra possesses are beneficial for bowel purification. Due to okra fiber content, sufficient water levels in faces are ensured. Consequently, no discomfort and constipation bothers the patient. Wheat bran, applied for this purpose, can impose certain irritation on the bowels, while okra makes it smooth and allconvenient and safe for the user. Mucilage provides soft effect on the bowels. Stimulating bile movement, okra washes excess cholesterol and harmful substances from the body. This benefits the organism in general, as the toxins and bad cholesterol can induce various health conditions. Okra poses no threat to the organism, causes no addiction; it is completely safe and Reliable. Moreover, it contains a bunch of useful nutrients and is cheaper than chemical alternatives.

Its medicinal value has also been reported in curing ulcers and relief from haemorrhoids.<sup>[31]</sup> Unspecified parts of the plant were reported in 1898 to possess diuretic properties<sup>[32]</sup> this is referenced in numerous sources associated with herbal and traditional medicine. Okra has found medical application as a plasma replacement or blood volume expander.<sup>[33],[34],[35],[36]</sup> It is also good source of iodine which is useful in the treatment of simple goiter and source of other medically useful compound.<sup>[37]</sup> It is very useful genitourinary disorders, spermatorrhoea and chronic dysentery.<sup>[88]</sup> Tests conducted in China suggest that an alcohol extract of okra leaves can eliminate oxygen free radicals, alleviate renal tubular-interstitial diseases, reduce



protein urea, and improve renal function.<sup>[39],[40]</sup> Unspecified parts of the plant were reported in 1898 to possess diuretic properties<sup>[41]</sup> this is referenced in numerous sources associated with herbal and traditional medicine. Some studies are being developed targeting okra extract as remedy to manage diabetes.

Generally, okra is used to stabilize blood sugar by regulating the rate at which sugar is absorbed from the intestinal tract. It is a good vegetable for those feeling weak, exhausted, and suffering from depression and it is also used in ulcers, lung inflammation, sore throat as well as irritable bowel. Okra is good for asthma patients and it also normalizes blood sugar and cholesterol levels. Previous studies reported that okra polysaccharide possesses anticomplementary and hypoglycemic activity in normal mice.<sup>[42]</sup> Also, okra polysaccharide lowers cholesterol level in blood and may prevent cancer by its ability to bind bile acids. Additionally, Okra seed possess blood glucose normalization and lipid profiles lowering action in diabetic condition.<sup>[43]</sup>

### **Pharmacological properties**

#### **Anti-fatigue and antioxidant effects**

Reactive oxygen species (ROS) are continuously produced in the system being essential for various biological processes but their high levels, due to an imbalance between formation and neutralization of these ROS, causes oxidative stress leading to cell damage.<sup>[44][45]</sup> Antioxidant agents protect the cell against such damages caused by ROS/free radicals. These antioxidants may be either natural or synthetic.<sup>[46]</sup>

The contents of total polyphenols and total polysaccharides were 29.5% and 14.8% in okra seeds and 1.25% and 43.1% in okra skin, respectively. Total flavonoids, isoquercitrin and quercetin-3-O-gentiobiose (5.35%, 2.067% and 2.741%, respectively) were only detected in okra seeds. Antioxidant assays, including 1-diphenyl-2-picrylhydrazyl scavenging, ferric reducing antioxidant power and reducing power test, and weight-loaded swimming test showed okra seeds possessed significant antioxidant and anti-fatigue effects. Moreover, biochemical determination revealed that that anti-fatigue activity of okra seeds is caused by reducing the levels of blood lactic acid and urea nitrogen, enhancing hepatic glycogen storage and promoting antioxidant ability by lowering malondialdehyde level and increasing superoxide dismutase) and glutathione peroxidase levels.<sup>[47]</sup>

Oxidation is essential for living organisms. Reactive oxygen species (ROS) also are produced during oxidation.<sup>[48]</sup> Organisms can maintain a dynamic equilibrium between production and elimination of ROS in normal conditions. However, when organisms are subjected to stress conditions, this equilibrium is disrupted. Excessive accumulation of ROS will result in cellular injuries, including lipid peroxidation, protein oxidation, and DNA damage, which are involved in development of a variety of diseases including cellular aging, mutagenesis, carcinogenesis, hepatopathies, diabetes, and neurodegeneration.<sup>[49]</sup> Therefore, cellular antioxidant defense systems play important roles in counteracting these deleterious effects of ROS.

Almost all organisms possess antioxidant defense systems including antioxidant enzymes and nonenzymatic antioxidants. However, these systems are insufficient to prevent the damage entirely in some cases.<sup>[50]</sup> Plants are the most important source of natural antioxidants.<sup>[51]</sup> Phenolic compounds or polyphenols, which consist of secondary metabolites, constitute a wide and complex array of phytochemicals that exhibit antioxidant actions. Epidemiological studies have indicated that regular consumption of foods rich in phenolic compounds is associated with reduced risk of cardiovascular diseases, neurodegenerative diseases, and certain cancers.<sup>[52]</sup> These phenolic compounds hold promising potentials in the development of health foods, nutritional supplements, and herbal medicines for the application as antioxidants and ROS-related disease chemopreventive agents.

### **Hypolipidemic and Anti diabetic effects**

Diabetes is a chronic condition which affects over 150 million people in the world today<sup>[11]</sup>. The percentage of people suffering from diabetes is increasing rapidly to the point that many medical authorities are referring to it as an epidemic. There are two main types of Diabetes, Type-1 Diabetes and Type-2 Diabetes other than gestational diabetes. Each has its own causes and risk factors, although both are characterized by high blood sugar.

The ethanolic extract of okra which contains, isoquercitrin and quercetin 3-O-gentiobioside reduced blood glucose and serum insulin levels and improved glucose tolerance in obese mice. The isoquercitrin treatment shows serum triglyceride levels and liver morphology in the mice were significantly ameliorated. Total cholesterol levels in isoquercitrin and quercetin 3-O-gentiobioside treated mice were also reduced. So okra may serve as a dietary therapy for hyperglycemia and hypertriglyceridemia.<sup>[53]</sup>

Okra is also used to improve cardiovascular disease. The okra reduce serum cholesterol and therefore decreases the chance of heart disease. The use of okra is an efficient method to manage the body's cholesterol level. Okra is additionally loaded with pectin that can help in reducing high blood cholesterol simply by modifying the creation of bile within the intestines.<sup>[54]</sup> Okra is used to improves heart health. The soluble fiber within okra helps you to reduce serum cholesterol and therefore decreases the chance of cardiovascular disease. Consuming okra is an efficient method to manage the body's cholesterol level. Okra is additionally loaded with pectin that can help in reducing high blood cholesterol simply by modifying the creation of bile within the intestines. Okra is also used to improves good eyesight. The okra pods are fantastic options for Vitamin A and also beta carotene that are both important nourishment for sustaining an excellent eye-sight along with healthy skin. Additionally, these types of important nourishment also assist inhibits eye associated illnesses along with problems on the skin. Okra is better ingested when joined along with other healthy veggies. Consuming okra has truly numerous advantages, simply bear in mind to eat natural veggies as opposed to processed veggies.

Okra is used to controls the body's cholesterol level. There are numerous significant illnesses related to high cholesterol level of the entire body. Managing the body's cholesterol level is nearly difficult because it's hard to avoid foods loaded with cholesterol content. One of the better health advantages of consuming okra is definitely the powerful management of the human body's high cholesterol level. This healthy vegetable is beneficial in slimming down and also decreasing cholesterol therefore keeps a healthy and also low cholesterol body. Okra have been taken advantage by diet advisors due to these qualities.

#### **Antiadhesive effects of okra**

*H. Pylori* Polysaccharide containing extracts from immature fruits of okra (*Abelmoschus esculentus*) are known to exhibit antiadhesive effects against bacterial adhesion of *Helicobacter pylori* (*H. pylori*) to stomach tissue. Ammonium sulfate precipitation of an aqueous extract yielded two fractions at 60% and 90% saturation with significant antiadhesive effects against *H. pylori*, strain J99, after preincubation of the bacteria at 1 mg/mL.<sup>[55]</sup>

#### **Neurological disorders (Alzheimer)**

The okra treatment provides important in vitro data on the effects of okra on various AID-associated cellular processes in H63D variant HFE cells. These results suggest okra may be

beneficial in people expressing the H63D variant to reduce the risk of Alzheimer's disease and other neurodegenerative diseases related to oxidative stress.<sup>[53]</sup> *Nootropic potential* The seed extracts of *Abelmoschus esculentus* L. possess antioxidant, antistress, and nootropic activities which promisingly support the medicinal values of ladies finger as a vegetable. So the pretreatment of mice with aqueous and methanolic seed extracts of *Abelmoschus esculentus* (200 mg/kg, p.o.) for seven days significantly ( $P < 0.01$ ) attenuated scopolamine-induced cognitive impairment in the passive avoidance test. These extracts were significantly reduced the blood glucose, corticosterone, cholesterol, and triglyceride levels elevated by acute restraint stress.<sup>[56]</sup>

### **Gastro protective effect**

*Abelmoschus esculentus* lectin (AEL) gastro protective effect on gastropathy induced by ethanol. 0.2 ml/animal, p.o. given to fasted mice of ethanol 99.9% received previously AEL (0.01, 0.1, 1.0, 10 or 50 mg/kg, i.v.), saline (5 ml/kg; i.v.) or ranitidine (80 mg/kg, p.o.). The mice were euthanized 30 min after ethanol challenge to verify the stomach damages. Gastric oxidative stress, tissue hemoglobin content and microscopic features were taken in order to characterize the AEL gastro protective effect. AEL (1 mg/kg) was capable of protect mucosa against ethanol damages in presence of two Evaluation of microscopic features, oxidative stress, and Hb levels pointed the protective effects of AEL. AEL simultaneously showed antioxidant effect that is probably implicated in its intricate defensive mechanism of action.<sup>[57]</sup>

### **Immunomodulating activity**

A water-soluble polysaccharide (OFPS11) was obtained from okra (*Abelmoschus esculentus*) flowers using aqueous extraction and purification with DEAE-52 cellulose and Sephacryl™ S-500 column. Its preliminary characterization and immunomodulating activity were investigated. Results showed that OFPS11 is mainly composed of galactose and rhamnose in a molar ratio of 2.23:1 with molecular mass of 1,700 kDa. RAW264.7 cells pretreated with OFPS11 significantly inhibited the proliferation of HepG-2 cells. Additionally, OFPS11 enhanced the phagocytic ability and induced the elevation of NO production, TNF- $\alpha$  and IL-1 $\beta$  secretion of RAW264.7 cells. OFPS11 can strongly increase NF- $\kappa$ B levels in nucleuses, which is an important transcription factor that can modulate expressions of iNOS, NO and TNF- $\alpha$ . These outcomes support that OFPS11 exerts its antitumor activity by probably stimulating macrophage activities through nuclear NF- $\kappa$ B pathway.<sup>[58]</sup>

To regulate constipation and acid reflux, a man, who has been exposed to constipation for almost 20 years and had a recent experience of acid reflux, tried consuming 6 okra pieces daily.

There was no chemical drug addition to his therapy. His sugar levels in blood became normal; additionally, his acid reflux and cholesterol cause no more problems.

## CONCLUSION

The information presented here shows the potential nutritional importance of Okra and its role in improved nutrition and health. It is an affordable source of protein, carbohydrates, minerals and vitamins, dietary fibre and health promoting fatty acids. This is due to the complex nature of disease etiology and various factors impacting their occurrence. It is imperative the scientific community continues to unravel the mechanisms involved in disease prevention and determine how food bio-actives from such foods as Okra can influence human health. Further research, needs to be performed to provide compelling evidence for the direct healthbenefits of Okra consumption. Okra (*Abelmoschus esculentus* (L.) Moench) is a medicinal plant of immense importance with large pharmacological applications. Besides having the above mentioned nutritional and medical, industrial properties, it has been used as an ingredient of many herbal formulations, which are used for the cure of various ailments, in particular the regulation of blood pressure, fat, diabetes, chronic dysentery genito-urinary disorders, simple goiter and ulcer.

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