

## Okra and the Heart: Reducing Cardiovascular Risk by Lowering Blood Sugar with Okra

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### Abstract

Controlling blood sugar may help reduce cardiovascular risk, particularly in people predisposed to or coping with obesity and diabetes. Recent studies have suggested that okra might help lower blood sugar in patients with diabetes as well as expectant mothers with gestational diabetes. Also, a diet including okra might help maintain healthy blood sugar levels in asymptomatic people, thus acting as a natural and convenient preventive agent.

**Keywords:** *Allopolyploid; Cardiovascular Risk; Diabetes; Okra; Blood Sugar; Polysaccharides*

### Abbreviations

AKT: Protein Kinase B; EO: Ethanol Extract of Okra; GSK3 $\beta$ : Glycogen Synthase Kinase 3 Beta; HO-1: Heme Oxygenase-1; Nrf2: Nuclear Factor Erythroid-2; OP: Polysaccharides Isolated in Okra; PI3K: Phosphoinositide 3-Kinase; SOD2: Superoxide Dismutase 2

### Introduction

The name okra is from a West African language, first used around the year 1670 [1,2]. This same plant goes by the French name, gombo, which became widely used in the Southeastern United States and the English-speaking Caribbean. Okra is cultivated in warm, subtropical, and tropical climates [1,2]. Okra, *Abelmoschus esculentus*, also known in English speaking countries as “ladies’ fingers”, is an allopolyploid. Raw okra is 90% water, 2% protein, 7% carbohydrates, and negligible in fat—containing copious amounts of vitamins and minerals (Figure 1).

Many health properties are attributed to okra, including (but not limited to):

- Preventing and relieving constipation
- Lowering cholesterol
- Reducing the risk of some forms of cancers (especially colorectal cancer)
- Improving the energy levels and symptoms of depression
- Helping to treat sore throat, irritable bowel disease, ulcers, and lung inflammation
- Reducing cardiovascular risk and diabetes by managing blood glucose levels

Okra, raw		
Nutritional value per 100 g (3.5 oz)		
<b>Energy</b>	138 kJ (33 kcal)	
<b>Carbohydrates</b>	7.46 g	
Sugars	1.48 g	
Dietary fibre	3.3 g	
<b>Fat</b>	0.19 g	
<b>Protein</b>	1.9 g	
<b>Vitamins</b>	<b>Quantity</b>	<b>%DV†</b>
Vitamin A equiv.	36 µg	5%
Thiamine (B <sub>1</sub> )	0.2 mg	17%
Riboflavin (B <sub>2</sub> )	0.06 mg	5%
Niacin (B <sub>3</sub> )	1 mg	7%
Folate (B <sub>9</sub> )	60 µg	15%
Vitamin C	23 mg	28%
Vitamin E	0.27 mg	2%
Vitamin K	31.3 µg	30%
<b>Minerals</b>	<b>Quantity</b>	<b>%DV†</b>
Calcium	82 mg	8%
Iron	0.62 mg	5%
Magnesium	57 mg	16%
Phosphorus	61 mg	9%
Potassium	299 mg	6%
Zinc	0.58 mg	6%
<b>Other constituents</b>	<b>Quantity</b>	
Water	89.6 g	

[Link to Full USDA Database entry](#)

Units  
µg = micrograms • mg = milligrams  
IU = International units

Figure 1: USDA database entry illustrating the nutritional value of Okra [3].

Recent studies have shown blood glucose-lowering effects in patients who have consumed a cup of water daily from soaked slices of okra. These studies did not claim okra was a cure for diabetes, but that it lowered blood sugar levels in diabetic patients. In 2012, Watson wrote: “There is anecdotal evidence for the amelioration of diabetes by dietary consumption of okra but what are lacking are controlled clinical trials. There are constituents of okra, such as polyphenolic molecules, that provide encouragement for such studies in the future” [4]. A few years after Watson’s indication that okra lowered blood sugar in diabetic patients, other researchers began to examine the validity of Watson’s findings.

#### Method used to prepare an okra drink

The method used to prepare the okra drink is to cut okra into slices and let them soak in clean water overnight. The resultant gluey water (juice) is consumed in the morning.

### How does okra lower blood sugar and maintain optimal blood sugar levels?

The viscosity of okra carbohydrates helps to reduce the uptake of sugar into the bloodstream by lessening the rate at which sugar is absorbed in the blood. The process reduces the glycemic load of sugar, thus disrupting the body's ability to process sugars properly [5].

### Recent research regarding okra blood glucose level-controlling effects

Multiple in vitro and in vivo studies have confirmed okra's potency in lowering blood sugar. In a study published in the *Journal of Pharmacy and BioAllied Sciences* (2011), researchers in India found that mice fed dried ground okra peels and seeds had a reduction in blood glucose levels. In the same study, other mice exhibited a steady decrease in blood glucose after a regular feeding of the same diet for about ten days [6].

A 2014 study examined the effect of okra extract on lowering blood sugar. The study concluded that the extract of okra lowered blood glucose and serum lipids in high-fat diet-induced obese C57BL/6 mice. The effects of an ethanol extract of okra (EO) and its major flavonoids, isoquercitrin and quercetin 3-O-gentiobioside, were evaluated regarding metabolic disorders in high-fat diet-induced obese mouse. It was established that treatment with EO, isoquercitrin, and quercetin 3-O-gentiobioside reduced blood glucose and serum insulin levels and improved glucose tolerance in obese mice. Also, serum triglyceride levels and liver morphology in the mice were significantly reduced by EO and isoquercitrin treatment. The total cholesterol levels in isoquercitrin- and quercetin 3-O-gentiobioside-treated mice were reduced. It was found that EO inhibited the expression of nuclear receptor transcription factor PPAR $\gamma$ , which is a significant regulator of lipid and glucose homeostasis. Furthermore, the researchers determined that EO and quercetin 3-O-gentiobioside have antioxidant activity in vitro. The results indicated that okra might serve as a dietary therapy for hyperglycemia and hypertriglyceridemia [7].

Another in vivo study this year (May 2019) presented the possible impact of polysaccharides isolated in okra (OP) in reducing the glycemic level in the blood. The administration of OP at 200–400 mg/kg body weight significantly alleviated symptoms associated with elevations in blood sugar, including triglycerides, total cholesterol, low-density lipoprotein cholesterol (as well as high-density lipoprotein cholesterol), body weight, and food and water consumption. The OP treatment increased hepatic glycogen and decreased fatty hepatic cords and liver fibrosis in mice.

According to the researchers, OP improved blood sugar level through the activation of the phosphoinositide 3-kinase (PI3K)/protein kinase B (AKT)/glycogen synthase kinase 3 beta (GSK3 $\beta$ ) pathway, enhanced nuclear factor erythroid-2 (Nrf2) expression, and promoted Nrf2-mediated heme oxygenase-1 (HO-1) and superoxide dismutase 2 (SOD2) expression. Also, OP relieved mitochondrial dysfunction by inhibiting NOX2 activation. The polysaccharides isolated from okra exert anti-type 2 diabetes mellitus effects partly by modulating oxidative stress through the PI3K/AKT/GSK3  $\beta$  pathway-mediated Nrf2 transport [8].

A study that included several polysaccharides not limited to okra showed similar and promising results. According to the authors of the study, polysaccharides (monosaccharide unit linked by glycosidic bonds) exerted favorable effects on glucose homeostasis, ameliorating type-2 diabetes (thus reducing cardiovascular risk). The researchers concluded: "Dietary polysaccharides enhance pancreatic  $\beta$ -cell mass, trigger insulin signaling pathways through insulin receptors, and activate the PI3K/Akt pathway. They modulate ERK/JNK/MAPK pathways and, thus, alleviate  $\beta$ -cell dysfunction" [9].

### Limitations in the use of okra in maintaining healthy blood glucose levels

The research described herein concerned okra's effect on controlling or lowering blood sugar levels, particularly in type 2 diabetic patients, and extrapolating that okra might have a cardiovascular risk-reducing effect. However, to date, research has not shown okra to be a viable replacement for insulin. Thus, type 1 insulin-dependent diabetic patients should continue with their prescribed insulin regimen.

### Conclusion

Although okra consumption does not cure type-2 diabetes, there is a growing awareness that okra might aid in improving blood glucose levels in diabetic or prediabetic patients and help maintain healthy blood glucose levels in nondiabetic individuals. Thus, the regular consumption of okra might also aid in reducing cardiovascular risk. More research is needed regarding okra and blood sugar levels, okra and diabetes, and okra and the heart and cardiovascular system. Also needed are proper dosing guidelines for the application of okra in specific stages of certain conditions and disorders and as a preventive agent in maintaining healthy blood glucose levels.

### Conflict of Interest Statement

The authors declare that this paper was written in the absence of any commercial or financial relationship that could be construed as a potential conflict of interest.

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