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# Hibiscus esculentus against hyperglycemia and dyslipidemia

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## Core tip

Diabetes mellitus (DM) is a metabolic disorder characterized by abnormally elevated levels of blood glucose due to complete or relative insufficiency of insulin secretion or insulin resistance as well as disturbances in carbohydrate, fat and protein metabolism. The main efforts are control of hyperglycemia and dyslipidemia in diabetes patients. The antidiabetic plant, Hibiscus esculentus (Okra) were investigated by Hajian et al and were showed that favorable finding on improvement of blood glucose and lipid profiles in diabetic rats.

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## Introduction

Diabetes mellitus (DM) is a metabolic disorder characterized by abnormally elevated levels of blood glucose due to complete or relative insufficiency of insulin secretion or insulin resistance as well as disturbances in carbohydrate, fat and protein metabolism (1).

According to the International Diabetes Federation (IDF), 382 million people suffered from diabetes worldwide in 2013, a figure estimated to rise to 592 million adults by 2035.

Several mechanisms are thought to be involved in the pathogenesis of diabetic complications, all of them originating from hyperglycemia. Some of these pathways are formation of advanced glycation end products (AGEs), polyol pathway activation, aldol reductase activation, activation of protein kinase C (PKC), increase of some cytokines – such as insulin like growth factor-1 (IGF-1), transforming growth factor beta (TGF- $\beta$ ) – and the oxidative stress pathway (2). There are many evidences that oxidative stress plays a key role in the most pathogenic pathways of diabetic complications (2,3). AGEs induce lipid oxidation, in other hand peroxynitrite leads to low-density lipoprotein (LDL) oxidation and then LDL oxidized promote and induce atherosclerosis. Endothelial dysfunction, basement membrane thickening and atherosclerosis occur in diabetes and disturb to all vascularized organ specially in kidney, retina, nervous system, heart and skin (4).

Cardiovascular disease (CVD) remains the leading cause of morbidity and mortality for patients with type 2 diabetes, despite

recent significant advances in management strategies to lessen CVD risk factors. A major cause is the atherogenic dyslipidemia, which consists of elevated plasma concentrations of both fasting and postprandial triglyceride-rich lipoproteins (TRLs), small dense LDL and low high-density lipoprotein (HDL) cholesterol. Recent results have unequivocally shown that TRLs and their remnants are atherogenic (5). In summary oxidative stress and dyslipidemia in diabetes are the most important causes of diabetic vascular complications.

Many antidiabetic therapies focus on improving insulin sensitivity, increasing insulin production, and/or decreasing the level of blood glucose.

To day treatment of diabetes are drugs and hormone (insulin) therapy, change of life style and sport. There are 12 classes of antihyperglycemic drugs FDA-approved in the United States such as sulfonylureas, meglitinides, thiazolidinediones, dipeptidyl peptidase-4 (DPP-4) inhibitors, biguanides, sodium glucose transporter 2 inhibitors,  $\alpha$ -glucosidase inhibitors, amylin analogues and glucagon-like peptide-1 (GLP-1) receptor agonists. For treatment of dyslipidemia statins, fibrates and nicotinic acid have prescribed (4).

Despite these treatments and modifying lifestyle and sport, only approximately 50% to 60% of type 2 DM (T2DM) patients have achieved their glycemic goals and the clinical reports revealed that diabetes cannot be cured completely and the newer anti-diabetic drugs continue searching because the existing synthetic drugs have several limitations and side effects.

Normally beta cells in pancreatic islets are sensor of blood glucose and its impairments cannot be compensated through any treatment. Traditional or alternative therapy through medicinal plant plays a significant role in help and treating DM. Traditional medicinal plants and their phytochemical substances have been used in the treatment of DM and associated secondary complications more than a century, but only a few of these have proofed their safe and efficacious (6). Although the American Diabetes Association (ADA) does not recommend the use of natural supplements because of their inadequate efficacies or standardized formulations, many studies have documented their use (7,8).

The medicinal plants against diabetes contain phenolic compounds, flavonoids, triterpenes or fibers. The most of phenolic compounds (polyphenols) and flavonoids show antioxidant property. Their radical scavenging activities are related to substitution of hydroxyl groups in the aromatic rings of phenolic. The therapeutic approach to treating type 2 DM is to decrease postprandial glucose levels. It can be achieved through the inhibition of  $\alpha$ -glucosidases and  $\alpha$ -amylases by which delay the absorbance of carbohydrates in the intestine, leading to a decrease in the postprandial insulin level (9). In fact, triterpenes act as  $\alpha$ -glucosidase and  $\alpha$ -amylase inhibitors (10). Besides the use of triterpenes as AGEs inhibitors may be a potentially effective strategy to prevent diabetic complications (11). Recently Hajian et al investigated the effect of *Hibiscus esculentus* (Okra) seed and mucilage in reducing complications of diabetes in diabetic rats (12). They showed that okra seed and mucilage consumption significantly decreased blood glucose, lipid peroxidation, C-reactive protein (CRP), cholesterol, HDL-C, LDL-C, triglyceride and increased insulin level in diabetic rats in comparison with diabetic untreated group. Besides okra showed reduction of inflammation in pancreatic tissue of diabetic okra treated compared with untreated diabetic rat. In this study, effects of okra were studied on blood glucose and dyslipidemia simultaneously. In the many studies, reducing of diabetic complications attributed to antioxidant property of polyphenols in plants. The investigator also measured total flavonoid compound of Okra (13). The results – decrease of blood glucose, decrease of dangerous lipid profiles and increase of insulin – are very good findings. These results showed that the okra seed inhibited some pathogenic pathways of diabetes. Antioxidant activity of okra seed and its flavonoid compounds is very important in inhibition of diabetes pathogenic pathways specially inhibition of oxidative stress and inhibition of  $\alpha$ -glucosidases and  $\alpha$ -amylases. Although Okra has been used by diabetic patients for many years, but future clinical

studies are needed to approve the effects of okra in diabetic patients as hypoglycemic and blood lowering lipids agent.

#### Author's contribution

MT is the single author of the paper.

#### Conflicts of interest

The author declared no competing interests.

#### Ethical considerations

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the author.

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