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Review Article

Antidiabetic Properties with special reference to Anthocyanin's

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Abstract

This review briefly highlights Anthocyanin's anti-diabetic potential. Diabetes is an ongoing medical condition diagnosed when the body encounters lack or inefficient utilization of insulin. More than half of people are unaware of their diabetes condition, which can lead to serious health problems if not discovered and treated early. Numerous studies have demonstrated a possible link of diabetes with some particular type of food products; while on the other hand, there are some of the food ingredients that are beneficial in the management of diabetes. Acylated Anthocyanin's are used by the gut microbesin the large intestine. Glucose transporters are believed to have an essential function in anthocyanin absorption, nonetheless they are accountable for acylated and nonacylated anthocyanin absorbing differently

Keywords

Anthocyanin's, Hyperglycemia, Anti-Diabetic Properties, Activated Protein Kinase (AMPK), Glucose Transporters & Coloured Pigments

Introduction

Uncontrolled Diabetes can cause hyperglycemia or high blood sugar, which can damage many facets of the body, especially nerves and blood vessels. A recent WHO report estimates that 77 million Indians are living with diabetes (type-2) and 25 million are pre diabetics (at a higher risk for the condition). The mechanism found behind glycemic control of certain food products involves their affect on endocrinal hormonal secretion and organs that are involved in glucose metabolism directly or indirectly, comparable to synthetic medications (Isabelle et al., 2013). In clinical trials, changes in lifestyle result in a 58% reduction in diabetes risk after 3 years, demonstrating a cost-effective approach to preventing, delaying or slowing the onset of the disease (Tuso, 2014). There are four criteria that can be used to diagnose diabetes:

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(i) Fasting plasma glucose (FPG) >126 mg/dl,

(ii) Post prandial plasma glucose >200 mg/dl,

(iii) Random glucose level>200 mg/dl with classic signs and symptoms of hyperglycemia or

(iv) Hemoglobin A1C level >6.5% (Chaudhury et al., 2017)

Besides antidiabetic properties, anthocyanins possess anti-inflammatory and anti-carcinogenic health benefits also (Bhagavathi et al., 2018). Anthocyanins have antioxidative potential that scavenge the free radicals and protect cells from oxidative damage. They may also help reduce inflammation and support heart health (Khoo et al., 2017). The six most common anthocynanins, each has its own distinctive properties and contributes to the unique flavor of a variety of fruits and vegetables are Cyanidin, Delphinidin, Malvidin, Peonidin, Petunidin and Pelargonidin (Mattioli et al., 2020).

All colourful fruits and vegetables specially red, purple, and blue are rich in anthocyanins, show antidiabetic property by influencing level of body's metabolic rate, gut microflora, and inflammatory status of the body. According to a study conducted by Kang et al. (2022) showed favourable impact of anthocyanins on type-2 diabetes. A higher hypoglycemic effect was observed with acylated anthocyanin. With this strengthier intestinal microbiota was also perceived with the administration of acylated anthocyanin. It also increased absorption of nutrients. Acylated anthocyanins also preserve gut microbial balance, decrease pro-inflammatory pathways and control glucose and lipid metabolism (Kang et al., 2022).

Review of Literature

A clinical trial involving 58 diabetic patients used administration dose of 160 mg anthocyanin, twice daily extracted from blackcurrants and bilberries to treat symptoms of diabetes for 24 weeks (Li et al., 2015). Anthocyanin supplementation showed a significant reduction in fasting blood sugar level and insulin resistance, as well as reduction was found in the concentrations of 5-hydroxybutyrate and serum adiponectin levels in comparison to placebo supplementation. Takikawa et al. (2010) found that bilberry anthocyanin can improve hyperglycemia and insulin sensitivity in diabetic mice through AMPK activation at liver, adipose tissues and skeletal muscle levels. In skeletal muscle and adipose tissues, activation of AMPK leads to upregulation of glucose transporter 4 while suppressing glucose formation in the liver. This mechanism also leads to remarkable

decline in liver and serum lipid profile in the process of Acetyl-CoA carboxylase (ACC) phosphorylation, upregulation of peroxisome proliferator-activated receptor alpha (PPARα), Acyl-CoA oxidase, and carnitine palmitoyltransferase-1A gene expressions (Koh et al., 2015).

Positive influence of berries loaded with anthocyanins on heart disease was documented by Xu et al., 2021. The study included 44 researches that were based on different types of berries like blueberries, cranberries and blackcurrants. The review presented that anthocyanins consumption on a daily basis may decrease blood lipids with a decrease in the inflammation, which can lead to the development of heart disease. Anti hyperthensive properties were also noted of anthocyanins although some researches show that these results can be seen in some select situations only (Vendrame & Klimis-Zacas, 2019).

The diabetic management and Complications Trial (Nathean et al., 1993) shown that strict blood glucose management is beneficial in minimizing clinical diabetic complications. Significantly, but even excellent blood glucose management did not fully avoid problems, suggesting that additional treatment options are required. A plethora of in vitro and in vivo investigations on the antioxidant capabilities of anthocyanin's in cell culture and experimental diabetes models have been conducted. Certain visible indicators reveal variations in response to anthocyanin-rich extracts (Ghosh & Konishi, 2007).

A review also takes into account all available data from experiments in which studies were conducted on antidiabetic properties of different types of spices and functional foods. Srinivasan (2017) presented antidiabetic properties of fenugreek seeds (Trigonella foenumgraecum), garlic (Allium sativum), onion (Allium cepa) and turmeric (Curcuma longa). Similar impact on body was documented by Agarwal et al. (2022) in mustard (Brassica nigra), coriander (Coriandrum sativum), cumin seeds (Cuminum cyminum), ginger (Zingiber officinale), and curry leaves (Murraya koenigii).

Conclusion

Management of diabetes requires a multidisciplinary team approach of doctors, dieticians, patient educators, patients, and their families. Many functional foods and coulourful fruits and vegetables contain highly desirable anthocyanin compounds that show red colour in acidic solutions and blue colour in alkaline ones. Furthermore, human interventional studies have demonstrated that large dosages of anthocyanin's have the ability to prevent

or cure type-2 diabetes. In India, levels of knowledge, treatment, and control remain low, and this varies significantly by age group. To eliminate diabetes in India, multifaceted measures such as increased knowledge, medication adherence, and enhanced preventative and counselling services are required. This review provides the groundwork to conduct additional clinical trials.

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