

Salvia Species as Promising Natural Antidiabetic Agents: Bioactive Constituents, Molecular Mechanisms, and Therapeutic Potential

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Abstract

Diabetes mellitus is one of the fastest-growing metabolic disorders worldwide, emphasizing the need for safe and effective therapeutic alternatives with multiple biological targets. The genus *Salvia* (Lamiaceae), comprising more than 900 species, represents a rich source of bioactive phytochemicals with considerable antidiabetic potential. This poster summarizes current evidence regarding the antidiabetic properties of *Salvia* species, focusing on their major bioactive constituents, molecular mechanisms, and therapeutic applications. Phenolic compounds, particularly salvianolic acids, rosmarinic acid, danshensu, flavonoids, triterpenoids, and diterpenoids such as tanshinone IIA, have demonstrated significant glucose-lowering activities through complementary mechanisms. Experimental studies indicate that *Salvia* extracts and isolated constituents inhibit the carbohydrate-hydrolyzing enzymes α -amylase and α -glucosidase, enhance glucose uptake, improve insulin sensitivity, regulate hepatic glucose metabolism, and activate AMP-activated protein kinase (AMPK)-mediated signaling pathways. In addition, these phytochemicals exhibit potent antioxidant and anti-inflammatory properties, reducing oxidative stress, preserving pancreatic β -cell function, and alleviating diabetes-associated complications, including nephropathy, neuropathy, retinopathy, vascular dysfunction, and cardiomyopathy. Among the investigated species, *Salvia miltiorrhiza* has been the most extensively studied, with salvianolic acids and tanshinones demonstrating remarkable efficacy in both experimental and clinical settings. Other species, including *S. officinalis*, *S. fruticosa*, *S. nemorosa*, *S. virgata*, and *S. viridis*, have also shown promising enzyme inhibitory and antihyperglycemic activities. Collectively, the available evidence suggests that *Salvia* species constitute valuable natural reservoirs of multifunctional antidiabetic compounds with considerable potential for the development of novel phytopharmaceuticals. Nevertheless, further well-designed clinical studies are required to confirm their long-term efficacy, safety, and therapeutic applicability in diabetes management.

Index Terms

Salvia; Diabetes mellitus; Antidiabetic activity; Salvianolic acids; Tanshinone IIA; Rosmarinic acid; α -Amylase; α -Glucosidase; Phytochemicals