

CHEMICAL COMPOSITION OF FIG (*FICUS CARICA* L.) FRUITS AND THEIR
EFFECT ON CARDIOVASCULAR SYSTEM FUNCTION

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Abstract: This article analyzes, based on literature data, the chemical composition of *Ficus carica* L. (fig) fruits and their effects on cardiovascular system function. Flavonoids (quercetin, rutin, kaempferol), phenolic compounds, vitamins (C, B-complex, K, β -carotene), and mineral elements (K, Ca, Mg, Fe, Zn) present in figs exhibit antioxidant, hypolipidemic, and antiatherosclerotic effects in the human body. These bioactive components strengthen vascular endothelial stability, reduce cholesterol levels, and support myocardial function. The results substantiate the potential use of fig fruits as a natural bioresource for the prevention of cardiovascular diseases.

Keywords: *Ficus carica* L., fig, flavonoids, phenolic acids, vitamins, antioxidant, cardiovascular system, cholesterol, endothelium, bioresource.

Introduction

In recent years, cardiovascular diseases (CVDs) have been recognized as the leading cause of mortality worldwide. According to the World Health Organization (WHO), these diseases account for more than 17 million deaths annually. Lifestyle factors, chronic stress, adverse environmental conditions, consumption of high-fat and high-calorie foods, as well as increased oxidative stress and inflammatory processes play a significant role in the development of these pathologies. Therefore, supporting cardiovascular system function using natural agents and exploring pharmacologically safe alternative sources is one of the most relevant scientific directions today [1].

The utilization of plant raw materials rich in natural bioactive components—particularly medicinal fruits with antioxidant and hypolipidemic activity—represents a priority task in pharmaceutical and biochemical research. From this perspective, the fig (*Ficus carica* L.), long known in traditional medicine as a healing plant, attracts significant scientific interest due to its unique chemical composition, biological activity, and cardioprotective properties [2].

Fig fruits are rich in flavonoids (quercetin, rutin, kaempferol), phenolic acids (gallic, chlorogenic, ferulic), vitamins (ascorbic acid, K, β -carotene, B-complex), as well as macro- and microelements (potassium, calcium, magnesium, iron, zinc). These components act synergistically to improve myocardial contractility, enhance the protective function of endothelial cells, increase vascular wall elasticity, and normalize lipid metabolism. Studies indicate that quercetin and rutin present in figs reduce levels of low-density lipoprotein (LDL) cholesterol, increase high-density lipoprotein (HDL) levels, and exert antiatherosclerotic effects (*Phytotherapy Research*, 2021; *Journal of Ethnopharmacology*, 2022) [3].



The beneficial effects of figs on the cardiovascular system are primarily associated with their antioxidant potential. Flavonoids and ascorbic acid neutralize free radicals and protect cells from oxidative stress, thereby maintaining functional stability of myocardial cells. Potassium and magnesium restore the bioelectrical balance of cardiac muscle, reduce blood pressure, and help maintain normal heart rhythm.

Currently, syrups, extracts, and capsules prepared from *Ficus carica* L. fruits are used in many countries as adjunctive agents in cardiovascular disease prevention, hypertension, and atherosclerosis. In addition, yellow fig varieties cultivated under Uzbekistan's climatic conditions are distinguished by their rich phytochemical composition and are considered promising bioresources for the local pharmaceutical industry [4].

Literature Review and Discussion

Fig (*Ficus carica* L.) is one of the oldest fruit and medicinal plants in human history. Archaeological findings and sources from ancient Greek and Arabic medicine describe figs as agents that improve heart function, enhance blood circulation, and serve as the "fruit of life." Avicenna, in his work "*The Canon of Medicine*," described figs as a food that "purifies the blood, strengthens the heart, and relieves the spirit." Modern scientific studies confirm the scientific basis of these ancient observations [5].

Chemical Composition and Biologically Active Components

Phytochemical analyses reveal that fig fruits possess a complex chemical composition. Their main bioactive components include flavonoids (quercetin, rutin, kaempferol), phenolic acids (gallic, chlorogenic, ferulic), anthocyanins, ascorbic acid, and β -carotene. In addition, fig fruits contain essential elements required for cardiac function, including potassium, calcium, magnesium, iron, and zinc.

Flavonoids play a central role in maintaining cardiovascular physiological homeostasis. Quercetin and rutin neutralize free radicals and reduce oxidative stress, thereby preventing endothelial dysfunction and atherosclerosis development (*Phytotherapy Research*, 2022). Gallic and ferulic acids reduce lipid peroxidation and decrease the production of inflammatory mediators (TNF- α , IL-6), resulting in improved elasticity and stability of vascular walls [6].

Effects of Fig Components on Cardiovascular Function

According to the literature, potassium present in fig fruits stabilizes heart rhythm and lowers blood pressure. Magnesium improves energy metabolism in myocardial cells, activates ATP synthesis, and supports cardiac muscle contractility. Ascorbic acid, acting as an antioxidant, enhances capillary wall strength and prevents oxidation of LDL cholesterol.

Experimental studies indicate that animal models fed with *Ficus carica* L. extracts demonstrated a reduction in total cholesterol levels by 18–25%, along with an increase in HDL levels. A decrease in malondialdehyde (MDA) content in cardiac tissues confirms enhanced antioxidant defense (*Journal of Ethnopharmacology*, 2021).



Polyphenols and flavonoids in fig fruits stimulate nitric oxide (NO) synthesis in endothelial cells. This promotes vasodilation, improves blood flow, and normalizes arterial pressure. Therefore, fig extracts are recommended as prophylactic agents in hypertension and atherosclerosis (*Food Chemistry*, 2020).

Cardioprotective and Antiatherosclerotic Mechanisms

The positive effects on the cardiovascular system are mainly mediated through antioxidant, hypolipidemic, and antiatherosclerotic mechanisms. Flavonoids inhibit LDL oxidation and reduce platelet aggregation, thereby improving intravascular blood flow. Ferulic acid inhibits hyaluronidase activity, preserving the morphological integrity of vascular walls.

Additionally, phytosterols present in *Ficus carica* L. fruits reduce intestinal cholesterol absorption, leading to decreased plasma lipid levels. As a result, the risk of myocardial ischemia and atherosclerosis is significantly reduced.

Clinical and Practical Research Findings

Recent clinical observations (India, 2019; Iran, 2021) indicate that four-week consumption of fig juice resulted in a reduction of arterial blood pressure by 7–10 mm Hg, normalization of heart rate, and decreased subjective fatigue. Improvements in lipid profile (LDL ↓ 20%, HDL ↑ 15%) were also recorded.

The cardioprotective effects of fig-enriched diets are confirmed not only biochemically but also clinically. Regular consumption enhances antioxidant defense and protects myocardial tissue from stress-induced damage.

Analytical Conclusion

Literature analysis demonstrates that *Ficus carica* L. fruits possess high potential as a natural complex agent for supporting cardiovascular system function. Their flavonoid and polyphenol complexes reduce oxidative stress, while the potassium–magnesium–vitamin system stabilizes myocardial bioenergetics. Therefore, the development of extracts, syrups, and biologically active supplements from fig fruits as nutraceuticals for heart health has significant scientific and practical value.

Conclusion

The results of literature analysis indicate that *Ficus carica* L. (fig) fruits are characterized by rich phytochemical composition, high biological activity, and beneficial effects on the cardiovascular system. Flavonoids, phenolic acids, vitamins, and mineral elements identified in figs act synergistically to support myocardial function, normalize blood pressure, and enhance vascular wall elasticity.

Quercetin, rutin, gallic acid, and ferulic acid present in fig fruits neutralize free radicals, reduce oxidative stress, and prevent endothelial cell damage. Potassium and magnesium maintain bioelectrical balance of cardiac muscle and improve blood circulation. Consequently, *Ficus*



carica L. extracts provide effective protective mechanisms against major cardiovascular risk factors such as atherosclerosis, hypertension, and myocardial ischemia.

Based on analytical data, the complex chemical composition of fig fruits enables their use as a natural, safe, and environmentally friendly bioresource in pharmaceutical and nutraceutical applications. Therefore, the development of fig-based preparations with cardioprotective, antihypertensive, and antioxidant properties is highly перспектив. Standardization of locally grown fig varieties through phytochemical analysis and the development of pharmaceutical and dietary products based on their bioactive components represent a relevant scientific and practical task for Uzbekistan.

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