


## Phytotherapy in Atherosclerosis: A Review of the Most Effective Medicinal Plants in Iranian Traditional Medicine and Their Mechanisms of Action

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Article Info	ABSTRACT
<b>Article type:</b> Review Article	<b>Objective:</b> Atherosclerosis is a chronic disease characterized by the accumulation of lipid plaques and other substances on the walls of arteries, which can lead to narrowing and blockage of blood vessels, ultimately resulting in cardiovascular problems. This condition is associated with factors such as high blood pressure, diabetes, and genetic predispositions. Atherosclerosis is one of the leading causes of morbidity and mortality in modern societies, necessitating the development of effective treatment and preventive methods. The aim of this review is to examine the most important medicinal plants used in Iranian traditional medicine for the treatment of atherosclerosis, and to analyze their mechanisms of action in preventing and treating this disease.
<b>Article History:</b> Received: Nov. 10, 2024 Received: Feb. 23, 2024 Accepted: Feb. 25, 2025 Published Online: May. 17, 2025	<b>Methodology:</b> The present review study utilized keywords such as medicinal plants, traditional medicine, indigenous plants of Iran, and atherosclerosis. The articles were searched through academic databases including PubMed, Google Scholar, Scopus, and Web of Science, as well as specialized sources such as reference books, encyclopedias, and online research resources.
 <b>Correspondence to:</b> Roman Lysiuk	<b>Results:</b> The medicinal plants identified as being most effective in the treatment of atherosclerosis in Iranian traditional medicine include Equisetum arvense, Citrus limon, Curcuma longa, Rosmarinus officinalis, Allium sativum, Silybum marianum, Cynara scolymus, Crataegus monogyna, Zingiber officinale, Capsicum annum, Hypericum perforatum, Anethum graveolens, Petroselinum crispum, Salvia officinalis, Origanum vulgare, Brassica oleracea, Apium graveolens, Daucus carota, Lactuca sativa, Spinacia oleracea, Cucurbita pepo, Camellia sinensis, Cichorium intybus, Rhus coriaria, Medicago sativa, Mentha piperita, Linum usitatissimum, Malus domestica, Chelidonium majus, Satureja hortensis, Allium cepa, Portulaca oleracea, Glycine max, and Coriandrum sativum.
<b>Email:</b> pharmacognosy.org.ua@ukr.net	<b>Conclusion:</b> Medicinal plants in Iranian traditional medicine, with their active compounds that possess anti-inflammatory, antioxidant, and lipid-lowering properties, play a significant role in the prevention and treatment of atherosclerosis. These plants are particularly effective in reducing inflammation, improving vascular function, and preventing the accumulation of lipid plaques, thus contributing to the improvement of atherosclerosis. However, clinical studies and extensive trials are needed to confirm the therapeutic effects and optimal dosages of these plants, enabling their use as complementary therapeutic options in the management of atherosclerosis.
	<b>Keywords:</b> Chronic disease, cardiovascular, atherosclerosis, medicinal plants, traditional medicine, Iran
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### Introduction

Cardiovascular diseases have become highly prevalent in recent years [1]. Atherosclerosis is one of the most common and significant disorders of the cardiovascular system, characterized by the gradual accumulation of plaques within

the inner walls of arteries [2]. These plaques are composed of lipids, cholesterol, calcium, and other substances, which, over time, lead to thickening and hardening of the arterial walls [2]. While atherosclerosis and arteriosclerosis are often considered synonymous, there are important distinctions between the two [2]. Arteriosclerosis refers to

the general process of arterial hardening, while atherosclerosis is a specific type of arteriosclerosis that involves plaque buildup in the arteries, resulting in reduced blood flow [2].

Atherosclerosis typically progresses without noticeable symptoms in its early stages. However, as the disease advances and plaques grow, the artery openings narrow, limiting blood flow to organs and tissues [3]. This condition can lead to serious issues such as coronary artery disease, stroke, and heart attacks. Additionally, atherosclerosis can affect arteries in other parts of the body, causing problems such as poor circulation, delayed wound healing, and even sexual dysfunction in men [3]. The disease is a gradual process that may begin in childhood but can accelerate quickly. Therefore, the prevention and treatment of atherosclerosis and its associated diseases are of great importance [4].

The treatment of atherosclerosis primarily involves lifestyle changes such as smoking cessation, lowering high cholesterol, controlling blood pressure, and taking appropriate medications to reduce the risk of heart attacks, strokes, and other severe complications [4]. In its early stages, atherosclerosis may present no symptoms or mild symptoms, as plaque buildup occurs slowly and gradually. In fact, many individuals may remain unaware of their vascular problems until the disease reaches more advanced stages [5]. However, the symptoms of atherosclerosis can vary depending on the arteries affected and the location of the plaque buildup. If atherosclerosis occurs in the major arteries, symptoms may present more severely and include heart attacks, strokes, and blood clots [6].

Other warning signs in advanced atherosclerosis include chest discomfort (commonly referred to as angina pectoris), muscle cramps in the legs (due to restricted blood flow), and shortness of breath [6]. Symptoms typically become apparent when the artery is significantly narrowed or blocked. In most cases, individuals remain unaware of plaque buildup until they experience a medical emergency such as a heart attack or stroke. Therefore, the prevention and management of this disease are critical to avoiding serious complications [4-6].

Atherosclerosis is a progressive disease that typically begins with damage to the inner wall of the arteries. Factors such as high blood pressure, high levels of LDL cholesterol, high triglycerides, smoking, diabetes, obesity, physical inactivity, a family history of heart disease, and an unhealthy diet can increase the risk of developing the disease. Additionally, inflammation from conditions like arthritis and lupus, as well as elevated homocysteine levels in the blood, are

significant risk factors. Over time, the accumulation of fatty plaques, cholesterol, and other substances on the arterial walls can lead to the narrowing of arteries and restriction of blood flow. These plaques may rupture and form blood clots, which can cause heart attacks or strokes [4-6].

If left untreated, atherosclerosis can lead to severe health issues. These include angina pectoris (chest pain due to reduced blood flow to the heart), coronary artery disease (narrowing or blockage of the heart's arteries), heart attacks (caused by blood clots and disruption of blood flow to the heart), strokes (due to reduced blood flow to the brain), and peripheral artery disease (reduced blood supply to the legs, resulting in pain during movement) [7].

Treatment for atherosclerosis depends on the severity of the disease and the arteries affected. In cases where blood flow to the heart or brain is restricted, immediate treatment is necessary. Treatment methods include lifestyle changes, medication, and surgery. Lifestyle modifications involve quitting smoking, moderating alcohol intake, regular exercise, following a healthy diet, and maintaining a proper weight [8]. Medications such as statins to lower cholesterol, drugs for reducing blood pressure and blood sugar, and anticoagulants are commonly prescribed. In severe cases, surgical procedures like stent placement to open blocked arteries or bypass surgery may be required to restore proper blood flow [9].

In traditional medicine, the treatment of atherosclerosis primarily focuses on dietary adjustments, the use of herbal remedies, and lifestyle changes [10]. Traditional medicine emphasizes the use of natural substances to enhance circulation, reduce inflammation, and prevent plaque accumulation in the arteries [11]. Some of the therapeutic methods include the consumption of foods like garlic, saffron, ginger, and plant oils, which act as natural protectors of the arteries and help lower cholesterol. Regular physical activity and stress management are also essential principles of traditional medicine in the treatment of atherosclerosis [10,11].

Herbal remedies play a vital role in the treatment of atherosclerosis and can help reduce risk factors such as high cholesterol and inflammation [12]. Many medicinal plants possess anti-inflammatory and antioxidant properties, which can prevent plaque formation in the arteries [13]. Additionally, certain herbs are used to improve blood circulation and overall heart health [12,13]. Regular use of these plants, in conjunction with dietary and lifestyle changes, can be an effective natural approach to managing and preventing atherosclerosis and other cardiovascular diseases [14-17].

The aim of this study is to examine the most significant medicinal plants used in Iranian traditional medicine for the treatment of atherosclerosis and to analyze their

mechanisms of action in preventing and treating this disease.

## Methodology

In this review study, to explore the impact of medicinal plants on the treatment of atherosclerosis and their application in Iranian traditional medicine, a variety of keywords were used, including medicinal plants, traditional medicine, native to Iran, and atherosclerosis. Scientific articles and relevant sources on this topic were searched through reputable international databases such as PubMed, Google Scholar, Scopus, and Web of Science. These databases served as advanced academic resources for identifying research papers and clinical studies. Additionally, specialized resources, including reference books and encyclopedias on Iranian traditional medicine, were consulted to supplement the information. Alongside these resources, online searches in scientific databases and other credible digital sources were conducted to gather data on the therapeutic properties of native medicinal plants in Iran and their impact on atherosclerosis. The process of searching and collecting information was conducted in a comprehensive and systematic manner to compile a reliable

and well-documented article on the effects of medicinal plants in the treatment of atherosclerosis.

## Results

In Iranian traditional medicine, medicinal plants such as *Equisetum arvense*, *Citrus limon*, *Curcuma longa*, *Rosmarinus officinalis*, *Allium sativum*, *Silybum marianum*, *Cynara scolymus*, *Crataegus monogyna*, *Zingiber officinale*, *Capsicum annum*, *Hypericum perforatum*, *Anethum graveolens*, *Petroselinum crispum*, *Salvia officinalis*, *Origanum vulgare*, *Brassica oleracea*, *Apium graveolens*, *Daucus carota*, *Lactuca sativa*, *Spinacia oleracea*, *Cucurbita pepo*, *Camellia sinensis*, *Cichorium intybus*, *Rhus coriaria*, *Medicago sativa*, *Mentha piperita*, *Linum usitatissimum*, *Malus domestica*, *Chelidonium majus*, *Satureja hortensis*, *Allium cepa*, *Portulaca oleracea*, *Glycine max*, and *Coriandrum sativum* have been used for the treatment of atherosclerosis. The botanical details and properties of these medicinal plants are presented in Table 1.

**Table 1.** Medicinal Plants for Atherosclerosis in Iranian Traditional Medicine

Persian Name	English name	Scientific name	Herbal family	Mechanism [17-28]
Domeasbi	Horsetail	<i>Equisetum arvense</i>	Equisetaceae	Anti-inflammatory effects, reduction of cholesterol levels
Limou	Lemon	<i>Citrus limon</i>	Rutaceae	Antioxidant, reduction of blood lipids
Zardchobeh	Turmeric	<i>Curcuma longa</i>	Zingiberaceae	Anti-inflammatory, reduction of lipid oxidation
Rozmary	Rosemary	<i>Rosmarinus officinalis</i>	Lamiaceae	Antioxidant, protection of vascular walls
Sir	Garlic	<i>Allium sativum</i>	Amaryllidaceae	Cholesterol reduction, anti-inflammatory effects
Kharmaryam	Milk Thistle	<i>Silybum marianum</i>	Asteraceae	Liver protection, blood lipid reduction

Kangar	Artichoke	<i>Cynara scolymus</i>	Asteraceae	Cholesterol reduction, liver protection
Zalzalak	Hawthorn	<i>Crataegus monogyna</i>	Rosaceae	Increased blood flow, heart strengthening
Zangabil	Ginger	<i>Zingiber officinale</i>	Zingiberaceae	Anti-inflammatory, LDL reduction, improved circulation
Felfeleghermez	Red Pepper	<i>Capsicum annuum</i>	Solanaceae	Increased metabolism, reduced inflammation
Gole raei	St. John's Wort	<i>Hypericum perforatum</i>	Hypericaceae	Reduction of inflammation, improvement of vascular health
Shevid	Dill	<i>Anethum graveolens</i>	Apiaceae	Reduction of blood pressure, improvement of vascular health
Jafari	Parsley	<i>Petroselinum crispum</i>	Apiaceae	Anti-inflammatory, blood pressure reduction
Maryamgoli	Sage	<i>Salvia officinalis</i>	Lamiaceae	Anti-inflammatory, antioxidant
Pounehkouhi	Oregano	<i>Origanum vulgare</i>	Lamiaceae	Antioxidant, anti-inflammatory
Kalam	Cabbage	<i>Brassica oleracea</i>	Brassicaceae	Reduction of inflammation, reduction of blood cholesterol
Karafs	Celery	<i>Apium graveolens</i>	Apiaceae	Reduction of blood pressure, reduction of inflammation
Havich	Carrot	<i>Daucus carota</i>	Apiaceae	Antioxidant, improvement of cardiovascular health.
Kahou	Lettuce	<i>Lactuca sativa</i>	Asteraceae	Blood pressure reduction, antioxidant.
Esfenaj	Spinach	<i>Spinacia oleracea</i>	Amaranthaceae	Cholesterol reduction, vascular protection
Kadou	Pumpkin	<i>Cucurbita pepo</i>	Cucurbitaceae	Inflammation reduction, vascular wall protection
Chayesabz	Green Tea	<i>Camellia sinensis</i>	Theaceae	Antioxidant, cholesterol reduction

Kasni	Chicory	<i>Cichorium intybus</i>	Asteraceae	Reduction of inflammation, improvement of liver function
Somagh	Sumac	<i>Rhus coriaria</i>	Anacardiaceae	Antioxidant, reduction of blood cholesterol levels
Younjeh	Alfalfa	<i>Medicago sativa</i>	Fabaceae	Cholesterol reduction, liver function improvement
Naena	Mint	<i>Mentha piperita</i>	Lamiaceae	Inflammation reduction
Katan	Flaxseed	<i>Linum usitatissimum</i>	Linaceae	Cholesterol reduction, improvement of digestive function
Sib	Apple	<i>Malus domestica</i>	Rosaceae	Antioxidant, cholesterol reduction
Shatareh	Greater Celandine	<i>Chelidonium majus</i>	Papaveraceae	Anti-inflammatory, blood lipid reduction
Marzaeh	Savory	<i>Satureja hortensis</i>	Lamiaceae	Anti-inflammatory, blood pressure reduction.
Piaz	Onion	<i>Allium cepa</i>	Amaryllidaceae	Cholesterol reduction, anti-inflammatory effects
Khorfeh	Purslane	<i>Portulaca oleracea</i>	Portulacaceae	Antioxidant, inflammation reduction
Soya	Soybean	<i>Glycine max</i>	Fabaceae	Cholesterol reduction, improvement of cardiovascular function
Geshniz	Coriander	<i>Coriandrum sativum</i>	Apiaceae	Anti-inflammatory, cholesterol-lowering

Discussion

Atherosclerosis, or arteriosclerosis, is a chronic and progressive disease characterized by the gradual accumulation of fats, cholesterol, and other substances in the walls of blood vessels. This condition can lead to the obstruction of arteries and disruption of blood flow to various organs, including the heart and brain. Consequently, atherosclerosis is one of the primary causes of cardiovascular diseases, heart attacks, strokes, and kidney diseases. In traditional Persian medicine, particularly in

phytotherapy (herbal treatment), great emphasis is placed on the use of medicinal plants to mitigate risk factors for atherosclerosis, such as inflammation, oxidative stress, and metabolic disorders. This paper examines some of the most significant medicinal plants used in the treatment of atherosclerosis and their mechanisms of action [29].

Horsetail (*Equisetum arvense*) has been used in traditional Persian medicine for centuries due to its content of silica and antioxidant compounds. Silica in this plant strengthens blood vessel walls and improves vascular function. Furthermore, horsetail has the potential to reduce lipid



accumulation in arteries and prevent the formation of atherosclerotic plaques [30]. Lemon (*Citrus limon*) is recognized as a rich source of vitamin C, potent antioxidants, and flavonoids. These compounds help reduce oxidative stress and inflammation in blood vessels, thereby reducing the risk of endothelial damage. Additionally, lemon has been shown to lower LDL cholesterol (bad cholesterol) and increase HDL cholesterol (good cholesterol), both of which are key factors in the prevention of atherosclerosis [31]. Rosemary (*Rosmarinus officinalis*) is known for its anti-inflammatory and antioxidant properties. Compounds such as rosmarinic acid and caffeic acid found in rosemary can help reduce inflammation in blood vessels and prevent damage to endothelial cells. This plant also promotes blood circulation and helps reduce blood pressure, factors that can decrease the risk of atherosclerosis [32]. Garlic (*Allium sativum*) is one of the most commonly used medicinal plants in Persian traditional medicine with widespread effects in preventing cardiovascular diseases. Garlic is particularly effective in reducing LDL cholesterol levels and triglycerides. Moreover, compounds in garlic, such as allicin, can help reduce inflammation and improve vascular function, making it a potent remedy for preventing atherosclerosis [33]. Milk Thistle (*Silybum marianum*) is a significant medicinal plant in Persian traditional medicine, primarily used for liver protection and treating liver disorders. This plant contains the active compound silymarin, which has both antioxidant and anti-inflammatory properties. Studies have shown that milk thistle can reduce oxidative damage in the vascular walls, prevent the formation of atherosclerotic plaques, and lower LDL cholesterol and triglyceride levels [34]. Ginger (*Zingiber officinale*) is a widely used herb in Persian traditional medicine known for its anti-inflammatory and antioxidant properties. Ginger can help reduce inflammation and oxidative stress in the body. Additionally, it enhances blood circulation and helps lower blood pressure, factors that are important in preventing atherosclerosis. Research has shown that ginger also reduces LDL cholesterol and triglycerides [35]. Green Tea (*Camellia sinensis*), rich in polyphenolic compounds like epigallocatechin gallate (EGCG), is recognized for its beneficial effects in reducing the risk of atherosclerosis. These compounds exhibit antioxidant and anti-inflammatory properties, helping to reduce inflammation and oxidative stress in blood vessels. Green tea also lowers LDL cholesterol levels and raises HDL cholesterol, preventing the formation of atherosclerotic plaques [36]. Celery (*Apium graveolens*) is another medicinal plant recognized in Persian traditional medicine as a natural diuretic and blood pressure reducer. Celery can help

prevent atherosclerosis by lowering blood pressure and preventing lipid accumulation in the arteries. Additionally, it contains antioxidant compounds that prevent endothelial cell damage and strengthen vascular walls [37]. Peppermint (*Mentha piperita*) is an herb with anti-inflammatory and antioxidant properties that can help treat atherosclerosis. Peppermint can reduce inflammation in blood vessels and improve blood circulation, which helps prevent the formation of atherosclerotic plaques. Furthermore, it contributes to lowering LDL cholesterol levels and improving cardiovascular function [38]. Pumpkin (*Cucurbita pepo*), rich in fiber, antioxidants, and vitamins, can help reduce cholesterol and blood pressure. The compounds in pumpkin aid in reducing lipid buildup in arterial walls and prevent oxidative damage to endothelial cells [39].

In summary, many medicinal plants used in Persian traditional medicine can effectively prevent and treat atherosclerosis through various mechanisms, such as reducing inflammation, alleviating oxidative stress, lowering LDL cholesterol, raising HDL cholesterol, strengthening vascular walls, improving blood circulation, and reducing blood pressure [40, 41]. These plants can be considered as complementary therapeutic options alongside modern treatments for managing and mitigating the risks associated with this chronic and health-threatening disease.

## Conclusion

Medicinal plants used in Persian traditional medicine, which contain active compounds with anti-inflammatory, antioxidant, and lipid-lowering properties, play a crucial role in the prevention and treatment of atherosclerosis. These plants are particularly effective in reducing inflammation, improving vascular function, and preventing lipid plaque formation, which ultimately helps mitigate the progression of atherosclerosis. However, clinical studies and extensive trials are necessary to validate the therapeutic effects of these plants and determine the appropriate dosages for their use. Such research will enable these plants to be incorporated as complementary therapeutic options in the management of atherosclerosis.

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## Competing interests

The authors have no competing interests to declare that are relevant to the content of this article.

## Ethics approval

This study was performed in line with the principles of the Declaration of Helsinki.

## Consent to participate

Informed consent was obtained from all individual participants included in the study.

## Author contributions

ASH: Conceptualization, the original draft writing, investigation, writing including reviewing and editing and investigation and formal analysis; RL: Conceptualization, supervision, and project administration; RL and ASH Conceptualization, the original draft writing, investigation, writing including reviewing and editing.

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