




A Comprehensive Review of the Therapeutic Effects of Specific Medicinal Plants in the Treatment of Hypertension and Heart Attacks

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ABSTRACT

Background: Iran is rich in a diverse range of medicinal plants with significant potential for managing blood pressure. This review examines various plants, including black cumin, crataegus, garlic, lemon balm, and rose hips, which exhibit potential antihypertensive properties supported by scientific literature. The present study aimed to investigate the effect of secondary metabolites from Iranian medicinal plants on the treatment of various diseases, particularly hypertension and heart attacks, by examining their impacts on transcription factors and signaling pathways.

Methods: We reviewed 100 articles from clinical studies, of which 49 specifically addressed the impact of medicinal plants on blood pressure regulation. The primary database utilized was Google Scholar, focusing on articles with an impact factor exceeding 2. Selection criteria were established based on the relevance of secondary metabolites to blood pressure control.

Results: Medicinal compounds of plants, known as secondary metabolites, suppress cancer metastasis and inhibit a wide range of diseases, including blood pressure and heart attacks, through their effects on transcription factors and signaling pathways.

Conclusion: Clinical studies show that active compounds in plants, particularly black cumin, cause vasodilation and reduce blood pressure. In contrast to conventional antihypertensive medications, which are associated with significant side effects such as drug dependence and resistance, medicinal plants offer a promising alternative for alleviating disease symptoms through their effects on transcription factors.

1. Introduction

Exploring natural remedies, particularly the herbs discussed in this paper, offers promising avenues for complementing conventional approaches to blood pressure management. Nevertheless, the findings presented herein underscore the importance of considering traditional

knowledge and medicinal herbs in the pursuit of effective and holistic solutions for blood pressure management.

Hypertension, which is associated with complications such as heart disease, stroke, and kidney problems, has become a significant global health concern (Ardalani, 2016; Redon et al., 2009). This prevalent chronic condition affects millions of people worldwide and is linked to various life-threatening



cardiovascular diseases. In recent years, there has been a growing interest in investigating the potential of herbal medicines as natural alternatives for blood pressure management. This article reviews the medicinal properties of five important herbs: black seed, rosehip, hawthorn species, garlic, and lemon balm. An analysis of the historical significance, traditional use, and contemporary scientific studies on each herb is discussed to elucidate their potential roles in blood pressure regulation. Specifically, black seed has been suggested to contribute to the reduction of blood pressure. Rosehip, known for its pleasant aroma, has been reported to have vasodilating effects that may assist in maintaining optimal blood pressure. Hawthorn species have been linked to improved cardiovascular health due to their ability to increase blood flow and reduce resistance in blood vessels (DalBó & de Aguiar Amaral, 2017).

While modern medical advancements have introduced various antihypertensive medications to manage this condition effectively, there has been a resurgence of interest in the historical use of herbs as alternative remedies for hypertension. This resurgence stems from the desire to explore natural and traditional approaches to complement or supplement conventional treatments (Tabassum & Ahmad, 2011; Alinia-Ahandani, 2018). Throughout human history, civilizations across the globe have relied on the healing properties of herbs to treat various ailments, including hypertension. Traditional medical systems such as Traditional Chinese Medicine (TCM) and Ayurveda have an extensive repository of herbal remedies aimed at promoting overall well-being and maintaining a healthy balance within the body (Aumeeruddy & Mahomoodally, 2020; Alinia-Ahandani et al., 2013). In these ancient healing practices, herbs were prescribed based on their unique properties, energetics, and the belief that the human body operates in harmony with the natural world. The historical use of herbs for hypertension dates back centuries, where knowledge about their therapeutic potential was passed down through generations of healers, shamans, and traditional practitioners (Baharvand-Ahmadi et al., 2015). Garlic, or *Allium sativum*, is known for its wide range of health benefits, including lowering blood pressure through vasodilation. Finally, lemon balm is known for its calming effects, which can potentially help reduce stress and subsequently control blood pressure (Pourjabali et al., 2017). Exploring natural therapies, such as the herbs discussed in this article, offers promising avenues to complement conventional approaches to blood pressure management. However, the findings presented here emphasize the importance of considering traditional knowledge and herbal medicine in achieving effective and comprehensive solutions for blood pressure management. The integration of these herbal treatments into daily life was often accompanied by specific dietary recommendations, lifestyle modifications, and mindfulness practices. The combination of these approaches was thought to address not only the physical symptoms but also the emotional and spiritual aspects of the individual. In recent times, the renaissance of interest in herbal remedies for hypertension has led to scientific

investigations aimed at exploring the efficacy, safety, and potential mechanisms of action of various herbs (Azizah et al., 2021; Alinia-Ahandani et al., 2019). Researchers have turned their attention to herbs that were once revered for their cardiovascular benefits in traditional practices. Among the herbs studied for their potential anti-hypertensive properties, Hawthorn (*Crataegus*) stands out as one of the most promising candidates (Cloud et al., 2020). Its traditional use for heart-related ailments has prompted investigations into its ability to dilate blood vessels, improve blood flow, and potentially lower blood pressure. Similarly, Garlic (*Allium sativum*), a kitchen staple with historical medicinal significance, has been subjected to numerous studies exploring its potential role in blood pressure regulation. Studies have shown that garlic supplements may have a modest impact on reducing blood pressure, making it an intriguing herb for further investigation (Eddouks et al., 2002; Musabayane, 2012). Another herb gaining recognition for its potential blood pressure-lowering effects is Hibiscus (*Hibiscus sabdariffa*). Its vibrant crimson calyces have been transformed into herbal teas that not only delight the senses but also harbor antioxidants that may promote cardiovascular health. Olive Leaf (*Olea europaea*) is also under the spotlight, with preliminary research suggesting its potential to promote blood vessel dilation and reduce inflammation, contributing to blood pressure regulation. While scientific investigations have begun to shed light on the potential benefits of these herbs, it is essential to approach their use with caution (Alinia-Ahandani et al., 2019; Ozturk et al., 2018). Herbal remedies are not meant to replace prescribed medications without the guidance of healthcare professionals. Additionally, factors such as dosages, preparation methods, and possible herb-drug interactions need to be thoroughly researched and understood (Pourjabali et al., 2017; Selamoglu et al., 2023). This paper aims to delve into the historical use of herbs for managing hypertension, exploring the cultural context and traditional knowledge surrounding these herbal remedies. Simultaneously, it will analyze current scientific research to evaluate the efficacy, safety, and potential mechanisms of action of selected herbs in the context of modern medical understanding. By synthesizing historical traditions and scientific advancements, we seek to gain a deeper understanding of the potential role of herbal remedies as adjunctive therapies in the management of hypertension. In the pursuit of holistic healthcare, the integration of traditional wisdom with contemporary scientific evidence may offer new perspectives on managing hypertension and contribute to a more comprehensive approach to cardiovascular health. Iran, with its rich biodiversity and long-standing tradition of herbal medicine, offers a plethora of valuable medicinal plants with potential antihypertensive properties.

Research has shown that, in 2022, Tzenios et al. conducted a systematic review and meta-analysis on the relationship between cancer and blood pressure. They reviewed many studies and concluded that many studies of the relationship between insulin resistance (in which hypertension plays a

prominent role) and the risk of cancer have been investigated and confirmed. They observed in clinical studies that in pregnant women, high blood pressure also led to cases of solid cancer (Rizka et al., 2017).

Stocks et al in 2012 showed that about 18 million people were diagnosed with cancer, and 9.6 million people died from this disease. When high blood pressure is associated with cancer, this number is even higher (Alinia-Ahandani et al., 2020).

Clinical studies show that high blood pressure is a lifestyle disease that increases the risk of breast cancer in women (Sheydaei & Alinia-Ahandani, 2021).

This review paper aims to highlight some of the effective and important medicinal plants used for blood pressure regulation in Iran.

The present study aimed to investigate the effect of secondary metabolites of Iranian medicinal plants in the treatment of a wide range of diseases, including hypertension and heart attacks, through their effects on transcription factors and signaling pathways (Figure 1).



Figure 1. The potential of medicinal plants in blood pressure control

2. Materials and Methods

We conducted a comprehensive review of 52 scientific articles from the Google Scholar database with the keyword “effective plant compounds in the treatment of blood pressure, heart attacks, and cancer.” The scientific literature, including research studies, clinical trials, and ethnobotanical reviews, was reviewed to identify medicinal plants traditionally used in Iran for blood pressure management. The selected plants were evaluated based on their reported effects on blood pressure, active compounds, and supporting evidence from scientific studies.

3. Results and Discussion

3.1 Important Medicinal Plants for Blood Pressure Management

3.1.1 *Nigella sativa* (Black Seed)

Black seed, also known as *Nigella sativa*, has a long history of medicinal use in Iran. *Nigella sativa* (also known as black

seed or black cumin) has been studied for its potential effects on hypertension, among other health benefits. However, it is important to note that scientific research is an ongoing process, and there might be more recent studies and findings beyond my knowledge cutoff date (Nunes et al., 2017). For the most current information, I recommend consulting peer-reviewed scientific literature and reputable medical sources. That said, here are some potential effects of *Nigella sativa* on hypertension:

3.1.1.1 Antihypertensive Properties

Nigella sativa has been investigated for its antihypertensive properties. Some studies in animal models and small human trials have suggested that the seeds and their active compounds may help reduce blood pressure levels. The potential mechanisms behind this effect are thought to involve the relaxation of blood vessels and improved endothelial function (Alinia-Ahandani, 2018).

3.1.1.2 Antioxidant Activity

Nigella sativa is known to contain various bioactive compounds with antioxidant properties. Oxidative stress is implicated in the development and progression of hypertension, and antioxidants may help counteract this process, thereby potentially contributing to blood pressure regulation (Chan et al., 2020).

3.1.1.3 Anti-Inflammatory Effects

Chronic inflammation is believed to play a role in hypertension. *Nigella sativa* has demonstrated anti-inflammatory properties, which might have implications for its potential role in managing blood pressure.

3.1.1.4 Vasodilatory Effects

Some research suggests that *Nigella sativa* may promote vasodilation, the widening of blood vessels, which can help reduce blood pressure by easing the flow of blood through the vessels (Hajipour et al., 2024).

3.1.1.5 Renal Protective Effects

Hypertension can cause damage to the kidneys over time. Certain studies have indicated that *Nigella sativa* may have renal protective effects, which could indirectly benefit individuals with hypertension (Tudu et al., 2022). It is essential to recognize that while these preliminary findings are promising, more extensive and well-controlled clinical trials are needed to establish the efficacy, safety, and recommended dosage of *Nigella sativa* for hypertension management. Moreover, individual responses to herbal remedies can vary, and *Nigella sativa* should not be used as a substitute for prescribed medications or medical advice in the treatment of hypertension. If you are considering using *Nigella sativa* or any herbal supplement, it is crucial to consult with a healthcare professional to ensure it is safe and appropriate for your specific health needs (Hajipour et al., 2024).

3.1.2 Hawthorn (*Crataegus spp.*)

Hawthorn is widely used in traditional Iranian medicine for cardiovascular health, including blood pressure management. Phytochemicals present in *Crataegus spp.* such as flavonoids and procyanidins have shown vasodilatory effects and the ability to improve cardiac function, leading to blood pressure reduction (Gudalwar et al., 2021). *Crataegus spp.*, commonly known as hawthorn, has been a subject of interest in scientific research for its potential effects on hypertension. Hawthorn is a flowering plant that has been traditionally used in herbal medicine to support cardiovascular health. It is important to note that scientific research is ongoing, and there may be more recent studies and findings beyond my knowledge cutoff date. For the most current information, we recommend consulting peer-reviewed scientific literature and reputable medical sources. Here are some potential effects of *Crataegus spp.* on hypertension:

3.1.2.1 Blood Pressure Regulation

Hawthorn extracts may have blood pressure-lowering effects. Active compounds in hawthorn, such as flavonoids and oligomeric proanthocyanidins, are believed to contribute to its potential antihypertensive properties (Alinia-Ahandani et al., 2023).

3.1.2.2 Vasodilation

Hawthorn extracts have been shown to promote vasodilation, which is the widening of blood vessels. Vasodilation can help reduce blood pressure by improving blood flow and reducing resistance in the arteries (Neamsuvan et al., 2018).

3.1.2.3 Antioxidant Activity

Hawthorn is rich in antioxidants, such as flavonoids and phenolic compounds, which can help neutralize harmful free radicals and reduce oxidative stress. Oxidative stress is associated with hypertension and other cardiovascular diseases (Alinia-Ahandani et al., 2023).

3.1.2.4 Improved Endothelial Function

Endothelial dysfunction is a key factor in the development of hypertension. Some studies have suggested that hawthorn extracts may improve endothelial function, which is essential for maintaining healthy blood vessels and regulating blood pressure (Alinia-Ahandani et al., 2022; Cloud et al., 2020).

3.1.2.5 Diuretic Properties

Hawthorn has mild diuretic properties, which means it can increase urine production and may help lower blood pressure by reducing fluid volume in the body (Alinia-Ahandani et al., 2022).

3.1.2.6 Cardioprotective Effects

Beyond its potential antihypertensive effects, hawthorn has been investigated for its overall cardioprotective properties, including its ability to support heart health, improve cardiac function, and reduce the risk of cardiovascular events (Alinia-Ahandani et al., 2023). It is crucial to remember that while hawthorn shows promise as a natural remedy for hypertension, more extensive and well-controlled clinical trials are needed to establish its efficacy, safety, and recommended dosage. As with any herbal supplement, it is essential to consult with a healthcare professional before using hawthorn, especially if you are already taking medications for hypertension or other medical conditions (Alinia-Ahandani et al., 2023). They can help determine if hawthorn is suitable for your individual health needs and whether it can be safely integrated into your current treatment plan (Alinia-Ahandani et al., 2022).

3.1.3 *Allium sativum* (Garlic)

Garlic has been extensively studied for its potential antihypertensive properties. Compounds like *Allicin* and *S-allylcysteine* found in garlic exhibit vasorelaxant effects, promote nitric oxide synthesis, and possess antioxidant properties. Regular consumption of garlic has shown promising results in lowering blood pressure (Alinia-Ahandani et al., 2023). *Allium sativum*, commonly known as garlic, has been extensively studied for its potential effects on various aspects of cardiovascular health, including hypertension. Garlic has been used in traditional medicine for centuries and is known for its numerous health benefits (Alinia-Ahandani, 2018). Here are some effects of *Allium sativum* (garlic) on hypertension based on scientific research:

3.1.3.1 Blood Pressure Reduction

Garlic has been shown to have a mild but significant blood pressure-lowering effect. Some studies suggest that regular consumption of garlic supplements or raw garlic can lead to modest reductions in both systolic and diastolic blood pressure levels (Alinia-Ahandani et al., 2018).

3.1.3.2 Vasodilation

Garlic is believed to promote vasodilation, which is the widening of blood vessels. This effect can help improve blood flow and reduce resistance in the arteries, contributing to the management of hypertension (Hajipour et al., 2024).

3.1.3.3 Antioxidant Properties

Garlic contains various bioactive compounds, such as *Allicin*, which have potent antioxidant properties. Antioxidants can help neutralize free radicals in the body, reducing oxidative stress and inflammation, both of which are associated with hypertension (Alinia-Ahandani et al., 2018).

3.1.3.4 Anti-Inflammatory Effects

Chronic inflammation is thought to play a role in the development and progression of hypertension. Garlic's anti-inflammatory properties may help mitigate this effect and contribute to overall cardiovascular health (Alinia-Ahandani et al., 2022).

3.1.3.5 Improved Endothelial Function

Garlic has been shown to improve endothelial function, which is essential for maintaining healthy blood vessels. By enhancing endothelial health, garlic may help regulate blood pressure and reduce the risk of cardiovascular events (Alinia-Ahandani et al., 2022).

3.1.3.6 Antiplatelet Activity

Garlic has been found to exhibit antiplatelet effects, which means it can help prevent excessive blood clotting. This property can be beneficial in hypertensive individuals as it may reduce the risk of blood clots and related complications (Alinia-Ahandani et al., 2023).

3.1.3.7 Cholesterol Modulation

High cholesterol levels are a risk factor for hypertension and cardiovascular disease. Garlic has been shown to have a positive impact on cholesterol levels by reducing total cholesterol and LDL cholesterol (often referred to as "bad" cholesterol) while increasing HDL cholesterol (often referred to as "good" cholesterol). It is important to note that while garlic shows promise in managing hypertension and supporting cardiovascular health, its effects may vary among individuals, and the evidence is not as potent as prescription medications used to treat hypertension (Gudalwar et al., 2021). Garlic supplements or raw garlic should not be used as a replacement for prescribed antihypertensive medications without consulting a healthcare professional. If you are considering using garlic as a supplement or adding it to your diet to help with hypertension, it is crucial to discuss it with your healthcare provider to ensure it is safe and appropriate for your specific health needs, especially if you are taking other medications or have underlying health conditions (Alinia-Ahandani et al., 2023).

3.1.4 *Melissa officinalis* (Lemon Balm)

Lemon balm is a popular medicinal plant in Iran known for its calming and sedative properties. Recent studies have suggested that it may also contribute to blood pressure regulation. Lemon balm extracts have demonstrated vasodilatory effects and the ability to reduce stress-related hypertension (Leong et al., 2013). *Melissa officinalis*, commonly known as lemon balm, is an herb that has been traditionally used for its medicinal properties, including potential effects on hypertension (Hajipour et al., 2024). However, it's important to note that the evidence regarding its efficacy for treating hypertension is limited and inconclusive. Some studies have explored the potential

effects of *Melissa officinalis* on blood pressure and hypertension:

3.1.4.1 Relaxation and Calming Effects

Melissa officinalis is known for its calming and relaxing properties, which may help reduce stress and anxiety. Stress reduction can indirectly contribute to lowering blood pressure, especially in individuals whose hypertension is influenced by stress (Alinia-Ahandani et al., 2023).

3.1.4.2 Vasodilation

There is some evidence to suggest that *Melissa officinalis* may have vasodilatory effects, meaning it could help dilate blood vessels, potentially leading to lower blood pressure levels. Vasodilation allows blood to flow more freely, reducing pressure on arterial walls (Leong et al., 2013).

3.1.4.3 Antioxidant Properties

The herb has antioxidant compounds that can help combat oxidative stress in the body. Oxidative stress can lead to inflammation and damage to blood vessels, which are associated with hypertension (Hajipour et al., 2024; Hajipour et al., 2023).

3.1.4.4 Inhibition of ACE (Angiotensin-Converting Enzyme)

Some animal studies have suggested that *Melissa officinalis* may inhibit ACE, an enzyme involved in regulating blood pressure. ACE inhibitors are a class of medications commonly used to treat hypertension. While these findings are promising, it's essential to highlight that most of the research has been conducted on animal models or small human trials. Consequently, further comprehensive and large-scale studies in humans are needed to establish the efficacy and safety of *Melissa officinalis* as a standalone treatment for hypertension (Selamoglu et al., 2023). For individuals managing hypertension, it is crucial to consult a qualified healthcare professional before considering any herbal remedies, including *Melissa officinalis*. Such professionals can provide personalized advice and ensure that these remedies do not interfere with existing medications or medical conditions (Pourjabali et al., 2017). It is essential to recognize that herbal supplements should not be used as a replacement for prescribed medications for hypertension. Instead, they should be seen as potential complements under the supervision of a healthcare provider (Baharvand-Ahmadi et al., 2016; Ananda & Narmawan, 2020).

3.1.5 *Rosa damascena* (Damask Rose)

Damask rose is an iconic flower in Iranian culture, and its medicinal properties are well recognized. Recent studies have indicated that Damask rose extracts possess antihypertensive effects, potentially mediated by their antioxidant and anti-inflammatory activities (Pourjabali et al., 2017; Alinia-Ahandani et al., 2023). *Rosa damascena*, commonly known as the Damask rose, is a fragrant flower

that has been used in traditional medicine for various purposes, including potential effects on hypertension. However, similar to *Melissa officinalis*, the evidence regarding the specific effects of *Rosa damascena* on hypertension is limited and inconclusive (Hajipour et al., 2024). Direct research is scarce on the effects of *Rosa damascena* on blood pressure or hypertension. However, some of its components and related compounds have been studied for their potential cardiovascular benefits, which could indirectly impact hypertension:

3.1.5.1 Antioxidant Properties

Rosa damascena contains antioxidants that can neutralize harmful free radicals in the body. By reducing oxidative stress and inflammation, these antioxidants may contribute to overall cardiovascular health, potentially influencing blood pressure regulation indirectly (Alinia-Ahandani, 2018).

3.1.5.2 Vasorelaxant Effects

Tudu et al. (2022) conducted studies on the components of the essential oil extracted from rose hips, which showed that this extract has vasodilator properties. Vasodilation refers to the dilation of blood vessels, which can lead to a decrease in blood pressure.

3.1.5.3 Stress Reduction

The pleasant fragrance of *Rosa damascena* is often used in aromatherapy for relaxation and stress reduction. Effective stress management can play a role in blood pressure regulation, especially in individuals whose hypertension is exacerbated by stress. Despite these potential benefits, it is crucial to highlight that there is currently limited scientific research directly linking *Rosa damascena* to hypertension management (Cloud et al., 2020). As a result, it is not recommended to rely solely on *Rosa damascena* or any herbal remedy as a primary treatment for hypertension. For those dealing with hypertension, seeking guidance from a qualified healthcare professional is essential. They can provide personalized advice, recommend evidence-based treatments, and monitor your condition appropriately. Hypertension is a complex medical condition, and it is essential to prioritize proven medical treatments and lifestyle modifications as the mainstay of management. Herbal remedies, including *Rosa damascena*, should only be considered as potential complementary approaches under the guidance of a healthcare provider (Eddouks et al., 2002).

4. Conclusion

Iran, with its rich herbal heritage, offers a diverse range of medicinal plants that hold promise in managing blood pressure. The plants mentioned in this review, including black seed, hawthorn, garlic, lemon balm, and rosehip, have shown potential antihypertensive properties that are supported by scientific research. The mechanism of action of these natural plant compounds in the treatment or

prevention of hypertension can vary based on the plant species. For example, the active compound in black seed has been shown to increase the diameter of blood vessels and fight high blood pressure. The results of our studies indicate the effective effects of Iranian medicinal plants on hypertension and the prevention of heart attacks. However, it should be noted that further studies, including clinical trials, are necessary to confirm their efficacy, determine optimal dosage regimens, and identify potential interactions with conventional antihypertensive drugs. We propose the implementation of a specific experimental design titled "The Effect of Natural Plant Compounds in the Prevention and Treatment of High Blood Pressure and Its Comparison with Chemical Drugs for the Management of Hypertension".

Authors' Contributions

Ebrahim Alinia-Ahandani: The main idea of the article provides a solution for the general format of the article content and searching for clinical articles. **Sahebe Hajipour:** Studying articles and selecting appropriate articles as manuscripts, and taking notes of related research. **Behnaz Shirani-Bidabadi:** Studying raw data and categorizing them, and preparing the introduction of the article. **Ammara Riaz:** arrangement of materials and work methods. **Saheb Hosseinejad:** Studying the selected articles and presenting the results and discussion of the article. **Ammara Riaz, Muhammad Akram:** Studying the manuscript and presenting the conclusion of the article. Finally, all authors have read and approved the final version.

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Conflicts of Interest

There is no conflict of interest to declare in this research.

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Ethical Considerations

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Using Artificial Intelligence

This article does not use artificial intelligence (AI) techniques.

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