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ORIGINAL ARTICLE

An Ethnobotanical Review of the Therapeutic Effects of Medicinal Plants and Herbal Antioxidants on Blood Pressure in Central and Eastern Regions of Iran

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KEYWORDS

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ABSTRACT: High blood pressure is a widespread health problem that can lead to serious cardiovascular and renal complications. The use of medicinal plants as a natural treatment for blood pressure control is widespread, especially in Iran. These plants, with their antioxidant compounds and therapeutic properties, can be effective in managing blood pressure and improving cardiovascular health. This ethnobotanical review aims to investigate the therapeutic effects of medicinal plants on blood pressure in central and eastern regions of Iran, based on ethnobotanical documentation, and to introduce the plants traditionally used to control this condition. In this review study, the keywords "medicinal plants", "ethnobotany", "Iran", "blood pressure", "North Khorasan", "South Khorasan", "Kerman", "Sistan", "Fars", "Yazd", "Markazi", "Zanjan", "Sistan", and "Isfahan" were used to search for articles. The databases used included Google Scholar, SID, Magiran, PubMed, and Scopus. Relevant ethnobotanical articles were reviewed to analyze the texts. Medicinal plants such as *Rumex crispus L.*, *Ziziphus jujube* (L) H.Kars, *Olea europaea L*, *Echium amoenum L.*, *Rumex conglomerates* Murr, *Nectaroscordeum tripedale*, *Nectaroscordeum coelzi*, *Falcaria vulgaris*, *Smyrnium cordifolium*, *Anethum graveolens*, *Crocus hasskenechtii*, *Ziziphus spina-christi*, *Berberis integrima*, *Allium ursinum*, *Amygdalus scoparia*, *Ziziphus jujube*, *Tragopogon sp*, *Valeriana ficariaefolia* Boiss, *Atriplex leucoclada* Boiss, *Petroselinum crispum* (Mill.) Nyman, *Cerasus brachypetala* Boiss, *Anethum graveolence L.*, *Alhagi persarum* Boiss. & Buhse., *Berberis integerrima* Bunge, *Nigella sativa L.*, *Crataegusaronia (*willd.)Bosc., *Silybum marianum (L.)* Gaert, *Echium amoenum* Fisch. & C.A.Mey and *Cucumis sativus L.* were recognized as antihypertensive medicinal plants in the central and western regions of Iran. This review study highlights the long tradition of using medicinal plants to control hypertension in central and eastern Iran. These plants, which contain active compounds such as antioxidants, vasodilators, and anti-inflammatory agents, can effectively reduce blood pressure and improve cardiovascular health.

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INTRODUCTION

High blood pressure (hypertension) is a common and critical condition that can cause significant damage to the heart, kidneys, brain, and other organs [1]. Often asymptomatic, it has been called the "silent killer" [1]. Persistent high blood pressure can lead to serious health problems, including heart disease, stroke, kidney failure, and other complications [2]. Hypertension occurs when arterial blood pressure is abnormally high, which can damage blood vessel walls and increase the risk of cardiovascular disease and stroke [2]. While hypertension is usually asymptomatic, possible symptoms include headache, dizziness, shortness of breath, nosebleeds, vision changes, and chest pain [3]. Factors that influence hypertension include heredity, unhealthy lifestyle choices (high salt diet, lack of exercise, obesity, alcohol consumption, and smoking), aging, and chronic stress [4]. Diagnosis typically involves multiple blood pressure measurements by a healthcare professional. If readings are consistently high, additional tests such as blood, urine, and electrocardiogram (ECG) tests may be recommended [5]. Untreated hypertension can lead to complications such as heart disease (heart failure, heart attack, and arrhythmias), stroke, kidney failure, and vision problems [6]. Controlling blood pressure is important to prevent these complications. During pregnancy, high blood pressure can lead to pre-eclampsia, which poses risks to both the mother and fetus, potentially causing kidney and liver dysfunction, reduced fetal growth, and preterm delivery [7].

Chemical and pharmacological treatments for hypertension include several classes of drugs that help regulate blood pressure. Diuretics, such as hydrochlorothiazide and furosemide, reduce blood volume by increasing the excretion of sodium and water. Angiotensin-converting enzyme (ACE) inhibitors, such as enalapril and ramipril, and angiotensin II receptor blockers (ARBs), such as losartan and valsartan, work by dilating blood vessels [8]. Beta-blockers, such as atenolol and metoprolol, reduce heart rate, while calcium channel blockers, such as amlodipine and diltiazem, help dilate blood vessels. Alpha-blockers such as prazosin act on the nervous system to lower blood pressure. In addition, drugs such as methyldopa and hydralazine are used in specific and critical circumstances. These drugs are usually prescribed in combination and under medical supervision [8]. Blood pressure medications can have various side effects; diuretics can cause potassium deficiency and kidney problems, ACE inhibitors can cause dry cough and elevated potassium levels, and beta blockers can cause slow heart rate, fatigue, and breathing problems. Calcium channel blockers may cause leg swelling and headache, while alpha blockers may cause postural hypotension [9].

Traditional Iranian medicine offers natural methods to control and reduce high blood pressure through herbal medicines, dietary changes, relaxation techniques, and physical treatments such as cupping and massage. It is important for individuals to consult with a traditional medicine expert or physician to ensure that these methods are compatible with their health conditions [10]. Diseases cause considerable pain and suffering, and researchers are continually searching for effective treatments [11-15]. Medicinal plants are used in the treatment of various diseases because of their unique properties [16]. These plants contain active compounds, including antioxidants, vitamins, minerals, and flavonoids, that improve the functioning of various body systems [17-19]. Because medicinal plants typically have fewer side effects than chemical drugs, many people prefer them as complementary or alternative treatments for chronic and inflammatory diseases [20-23]. In addition, medicinal plants can strengthen the immune system, reduce inflammation, improve digestion, and regulate cardiovascular function. Consequently, the use of medicinal plants is beneficial not only for the treatment of disease symptoms but also for the prevention of certain diseases [24-26].

This review aims to identify and report medicinal plants documented in ethnobotanical knowledge regarding blood pressure in central and eastern Iran. This research, based on ethnobotanical documents, identifies and presents plants traditionally used in these regions to control hypertension.

MATERIALS AND METHODS

In this review, the keywords used to search for related articles included "medicinal plants," "ethnobotany," "hypertension," and the names of different Iranian provinces such as North Khorasan, South Khorasan, Kerman, Sistan, Fars, Yazd, Markazi, Zanjan, and Isfahan. Scientific and research articles were obtained from databases such as Google Scholar, SID, Magiran, PubMed, and Scopus. A total of 23 relevant ethnobotanical articles were identified, of which 15 contained information on blood pressure. In addition, ethnobotanical articles were used to review texts and extract information from different sources to provide a better and more comprehensive understanding of the use of medicinal plants in controlling blood pressure in different regions of Iran.

RESULTS

The obtained results showed that the plants listed in Table 1 are used in different regions of Iran. Considering the climatic and cultural diversity, these plants can be categorized based on geographical regions:

Mobarakeh: Located in Isfahan, this region utilizes various plants from the Polygonaceae, Rhamnaceae, Oleaceae, and Boraginaceae families. Major plants include *Rumex crispus*, *Ziziphus jujuba*, *Olea europaea*, and *Echium amoenum*.

Natanz: Plants from the Polygonaceae, Amaryllidaceae, Apiaceae, and Iridaceae families are used for treatment in this region. Notable plants include *Rumex conglomeratus*, *Nectaroscordum tripedale*, *Nectaroscordum kochii*, and *Falcaria vulgaris*.

Lorestan: This area contains plants from several families, including Apiaceae, Rhamnaceae, Iridaceae, and Berberidaceae. Important plants include *Anethum graveolens*, *Ziziphus spina-christi*, *Crocus sativus*, and *Berberis integerrima*.

Sistan: Known for the use of plants from the Ranunculaceae family, with *Nigella sativa* being a notable species.

Khorasan (Mashhad): Uses plants from the Boraginaceae and Cucurbitaceae families. Important plants include *Echium amoenum* and *Cucumis sativus*.

See Table 1 for complete information.

Table 1. Medicinal Plants Used in the Ethnobotanical Knowledge of Central and Eastern Iran for the Treatment of Blood Pressure.

Scientific name	Herbal family	Persian name	Used organ	Therapeutic	Region
Rumex crispus L.	Polygonaceae	Torshak	Leaf	Diuretic effects, reducing blood volume and promoting sodium and water excretion, thus lowering blood pressure.	Mobarakeh [27]
Ziziphus jujuba(L) H.Kars	Rhamnaceae	Anab	Fruit	Anti-inflammatory and antioxidant properties, vasodilation, and improvement of cardiovascular function.	Mobarakeh [27]
Olea europaea L	Oleaceae	Zeytoun	Fruit	Antioxidant, anti-inflammatory, vasodilation, and reducing vascular resistance, lowering blood pressure.	Mobarakeh [27]
Echium amoenum L.	Boraginaceae	Gav zaban	Flower	Anti-inflammatory and antioxidant effects, improvING vascular and heart function, contributing to lower blood pressure.	Mobarakeh [27]
Rumex conglomerates Murr	Polygonaceae	Torshak	Leaf and stem	Diuretic effects, reducing blood volume and helping to lower blood pressure.	Natanz [28]
Nectaroscordeum tripedale	Amarrylidacaeae	Piaze tabestaneh lorestani	Shoot	Vasodilation and blood pressure reduction through improved cardiovascular health.	Lorestan [29]
Nectaroscordeum coelzi	Amarrylidacaeae	Piaze tabestaneh lorestani	Shoot	Similar effects to *Nectaroscordeum tripedale*, promoting vasodilation and reducing blood pressure.	Lorestan [29]
Falcaria vulgaris	Apiaceae	Ghazyaghi	Leaf, flower and stem	Anti-inflammatory and antioxidant effects, helping in vasodilation and lowering blood pressure.	Lorestan [29]
Smyrnium cordifolium	Apiaceae	Andol	Seed	Blood pressure regulation via diuretic and anti-inflammatory effects.	Lorestan [29]
Anethum graveolens	Apiaceae	Shevid	Shoot	Anti-inflammatory, vasodilation, and blood pressure reduction.	Lorestan [29]
Crocus hasskenechtii	Iridaceae	Pishouk	Root	Anti-inflammatory and antioxidant effects, promoting better vascular function and reducing blood pressure.	Lorestan [29]
Ziziphus spina-christi	Rhamnaceae	Sedr	Leaf, fruit	Vasodilation, calming effects on the nervous system, contributing to lower blood pressure.	Lorestan [29]
Berberis integrima	Berberidaceae	Zereshk	Leaf and stem	Anti-inflammatory and antioxidant effects, helping in vasodilation and blood pressure reduction.	Lorestan [29]
Allium ursinum	Asteraceae	Valak	Shoot	Blood pressure reduction through vasodilation and antioxidant effects.	Lorestan [29]
Amygdalus scoparia	Rosaceae	Badam	Fruit	Antioxidant, anti-inflammatory, and vasodilation effects, lowering blood	Lorestan [29]

				pressure.	
Ziziphus jujuba	Rhammaceae	Anab	Fruit	Calming and vasodilatory effects that help reduce blood pressure.	Iranshahr [30]
Tragopogon sp	Asteraceae	Sheng	Aerial parts	Vasodilation and anti-inflammatory effects, lowering blood pressure.	Gardanerokh of chaharmaham and Bakhtiari [31]
Valeriana ficariaefolia Boiss	Valerianaceae	Alafe gorbeh	Root	Calming and vasodilatory effects, helps reduce blood pressure by acting on the nervous system.	Chopar of Kerman [32]
Atriplex leucoclada Boiss	Brassicaceae	Kolmak	Leaf	Diuretic and antioxidant effects, helps reduce blood pressure.	Khash [33]
Petroselinum crispum (Mill.) Nyman	Apiaceae	Jafari	Leaf	Anti-inflammatory, vasodilatory effects, and blood pressure reduction.	Darab [34]
Cerasus brachypetala Boiss	Rosaceae	Albaloye kuhestani	Fruit	Antioxidant and anti-inflammatory effects, lowering blood pressure.	Dastena [35]
Anethum graveolence L.	Apiaceae	Shavid	Aerial parts	Vasodilation and blood pressure reduction.	Dehe-lolo of Kerman [36]
Alhagi persarum Boiss. & Buhse.	Fabaceae	Kharshotor	Leaf	Diuretic effects, reducing blood pressure through sodium and water excretion.	Dehe-lolo of Kerman [36]
Berberis integerrima Bunge	Berberidaceae	Zarch	Fruit	Anti-inflammatory, and vasodilatory effects, helping lower blood pressure.	Sirjan of Kerman [37]
Nigella sativa L.	Ranunculaceae	Siahdaneh	Seed	Antioxidant, vasodilatory, and blood pressure-lowering effects.	Sistan [38]
Crataegusaronia (willd.)Bosc.	Rosaceae	Kialak	Fruit	Vasodilation, antioxidant effects, and blood pressure reduction.	Fasa [39]
Silybum marianum (L.) Gaert	Asteraceae	Kharmaryam	Aerial parts	Antioxidant and vasodilatory effects, helping lower blood pressure.	Kazeroun [40]
Echium amoenum Fisch. & C.A.Mey	Boraginaceae	Golegavzaban	Flower	Vasodilation and blood pressure reduction.	Mashhad [41]
Cucumis sativus L	Cucurbitaceae	Khiar	Seed	Diuretic effects, reducing blood volume and helping lower blood pressure.	Mashhad [41]

According to the results, the Apiaceae family represents 15.15% of the plants listed, followed by Asteraceae with 12.12%, and Rhamnaceae and Rosaceae with 9.09% each. Polygonaceae, Boraginaceae, Amaryllidaceae, and Berberidaceae families account for 6.06% each. Families with less representation, at 3.03%, include Oleaceae, Iridaceae, Fabaceae, Ranunculaceae, and Cucurbitaceae.

From the findings, it can be concluded that leaves and fruits are the most commonly used plant organs for treating blood pressure, each accounting for 24.14% of organ use. Shoots, seeds, and aerial parts also make significant contributions with 13.79% each. Flowers, leaves, stems, and roots each account for only 6.90% of total organ use. Organs that are a combination of several plant parts, such as leaves, fruits, leaves, flowers, and stems have a lower representation at 3.45% each. These results indicate that leaves and fruits are the most commonly used plant organs for treating blood pressure, although other organs are also used significantly but to a lesser extent.

Geographically, Lorestan is the most represented region with 50% of the listed plants. This is followed by Mobarakeh with 14.29%. Other regions such as Dehlolo of Kerman and Mashhad each account for 7.14%, while Natanz, Iranshahr, Gardanerokh of Chaharmahal and Bakhtiari, Chopar of Kerman, Khashg, Darab, Dastena, Sirjan of Kerman, Sistan, Fasa, and Kazeroun each account for 3.57%. Thus, Lorestan is the most prominent region in this list.

DISCUSSION

In traditional Iranian medicine, medicinal plants are a primary source of treatment for various diseases, especially hypertension. These plants are deeply rooted in Iranian healing practices and have been extensively studied as traditional treatments in ethnobotanical research. Many indigenous medicinal plants of Iran are particularly recognized for their efficacy in controlling blood pressure and are used in various therapeutic traditions throughout the region.

Among the medicinal plants used in traditional Iranian medicine to lower blood pressure, leek is notable for its anti-inflammatory and antioxidant properties, which can effectively lower blood pressure [42]. Russian olive is known for its sedative properties and its efficacy in increasing blood flow, which helps lower blood pressure [43]. Olive and its leaves are highly regarded in Iranian traditional medicine as a natural remedy for lowering blood pressure and maintaining heart health due to their anti-inflammatory and antioxidant properties, which help reduce inflammation and improve circulation [44]. Olive also has liver, kidney, and neuroprotective activities, too [45, 46]. Borage flower, another powerful herb, is known for its calming properties and ability to reduce stress-induced blood pressure [47]. Wild garlic and dill are also used in traditional Iranian medicine to manage hypertension, with their diuretic and antioxidant properties helping to reduce cholesterol and consequently control blood pressure [48,49]. Saffron and black seed are effective in treating blood pressure due to their anti-inflammatory and sedative effects [50,51]. In addition, milk thistle and wild pear are used in the treatment of hypertension due to their active compounds that benefit cardiovascular function [52, 53]. Other medicinal plants, such as parsley and cucumber, effectively lower blood pressure through their diuretic properties, which increase fluid excretion from the body, making them natural supplements for hypertension management [54, 55].

The mechanisms involved in the antihypertensive activities of these plants have not been fully elucidated. Inflammation and the immune system, particularly chronic inflammation, are indisputable factors in hypertension pathogenesis [56]. Hence, plants with anti-inflammatory and immunomodulatory potentials [57-59] might be beneficial and reduce the consequences of hypertension, especially its cardiovascular complications.

Adaptive and innate immunities have also a substantial contribution to hypertension. They both can trigger microvascular remodeling and vascular inflammation. Dendritic cells, neutrophils, and activated macrophages can secret inflammatory cytokines contributing to blood pressure and endothelial dysfunction [60]. Other than immune system and inflammatory factors, oxidative stress is an indisputable contributor to blood pressure [56,61].

Antioxidant consumption, by trapping reactive oxidative stress and enhancing vascular function can improve vasodilation [62]. Hence, other medicinal plants with antioxidant activities [63-67] have the potential to be beneficial in hypertensive patients.

CONCLUSIONS

Overall, using these plants in traditional Iranian medicine is based on long-term experience, and scientific evidence supports their therapeutic properties in reducing blood pressure and improving cardiovascular health. However, the use of these plants should be done in consultation with a physician or traditional medicine specialist to avoid interactions with chemical drugs or other medical problems. Because medicinal plants can have different effects on different people, medical consultation is essential to achieve the desired results. These herbs not only aid in treating hypertension but also offer other benefits that contribute to overall health. Thus, Iranian traditional medicine offers a natural and effective approach to managing blood pressure and improving quality of life through the use of medicinal plants.

CONFLICT OF INTERESTS

NO conflict.

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