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# Hypotensive medicinal plants according to Ethnobotanical evidence of Iran: A Systematic Review

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**Abstract :** Hypertension is called the silent killer because it leads finally to death silently and asymptotically. If hypertension is not controlled at early stages, it disturbs the functions of cardiovascular system and other organs of the body. The aim of this review article is to report the medicinal plants used to treat hypertension in traditional medicine according to ethnobotanical evidence of different regions of Iran. This helps to offer different medicinal plants used to treat hypertension in these regions in a systematic manner, and approaches and keys to discover effective substances and develop new herbal drugs to researchers as well as to inform them of folk knowledge about using medicinal plants to prevent hypertension. In this article, 47 medicinal plants from 17 different regions in Iran were reported to be used to lower blood pressure. These plants can be investigated in animal studies and clinical trials to be used in developing herbal drugs for prevention and treatment of hypertension.

**Keywords :** High blood pressure, Folk medicine, Ethnobotany, Herb, Iran.

## Introduction

Currently, increased incidence of arterial hypertension is one of the most important public health problems across the world [1]. Worldwide, one billion people are suffering from arterial hypertension. Of these people, 7.1 million die as a result of this disease each year [2]. This common disease is an important risk factor for myocardial infarction, stroke, congestive heart failure, end stage renal disease, and peripheral artery disease [3,4]. The World Health Organization has reported that if systolic blood pressure exceeds 115 mmHg, it can be responsible for 62% of cerebrovascular accidents, 49% of ischemic heart disease, and a first degree risk factor for all-cause mortality across the world [2].

Arterial hypertension may silently lead to heart attack, heart failure, and renal failure through causing vascular injuries. Therefore, early diagnosis and control of arterial hypertension is particularly important. If arterial hypertension is mild, improvement of lifestyle, such as quitting smoking, weight loss, regular exercise, and healthy diet, can help to control blood pressure. If these ways fail to control blood pressure and arterial hypertension is severe, pharmacotherapy should be started quickly. Different drug categories are used to treat arterial blood pressure, including diuretic drugs, neural inhibitors (sympathic drugs), vascular dilators, and angiotensin-converting-enzyme (ACE) inhibitors. However, these drugs may cause certain side effects and have certain counterindications. For example, diuretic drugs can be problematic for some, especially older, people

because frequent urination is annoying at early stages of treatment. Besides that, diuretic drugs may cause positional vertigo, sweating, weakness, and fatigue which may be due to dehydration. Another side effect of these drugs in men is impotence. Moreover, neural inhibitors cause exacerbation of dyspnea in patients with asthma and obstructive pulmonary disease, and sympathetic inhibitors lead occasionally to impaired control of glycemia in patients with diabetes [5-7].

Because of side effects due to many of the chemical drugs and heavy costs of some of these drugs, there currently is a renewed, growing interest in using medicinal plants to treat different diseases [8-18]. Medicinal plants are nature-based. This causes these drugs to be well tolerated in the body, if they are used appropriately and knowledgeably with no fear of significant side effects, as with synthetic drugs [19-25]. Plants are able to synthesize various compounds and have long been used as remedies. Many plants are now being collected and examined to identify possible sources of drugs [26-40, 92-108]. Gathering knowledge about the culture of using medicinal plants in different regions is highly important, because this knowledge can contribute to taking steps to identifying new medicinal plants that are used to prevent and treat different diseases [41-44]. Furthermore, knowledge about effective plants can help to identify the effective compounds of these plants and to develop new, plant-based drugs [45-50]. In this regard, several studies have been conducted to identify the medicinal plants of different regions of Iran and to investigate the therapeutic effects of these plants [51-66]. However, knowledge about the routine methods of using medicinal plants among people from different cultures and regions seems necessary to produce more effective drugs to treat common diseases.

Iran is a vast country full of plants including many medicinal plants. Local communities in different required of Iran have acquired a deep knowledge about various uses of plants throughout history. Several ethnobotanical investigations have gathered, detected, and offered the cultures and habits of using different medicinal plants to prevent and treat different diseases [67-70,92-121]. However, no systematic study has yet been conducted to introduce different medicinal plants used to treat hypertension in different regions of Iran. This review article seeks to systematically introduce the medicinal plants reported to be effective on hypertension according to ethnobotanical documents of different regions of Iran. The findings of this work may offer some strategies and keys needed for discovering effective compounds and develop new herbal drugs to researchers.

In this review article, the key words including ethnobotany, ethnopharmacology, ethnomedicine, phytopharmacology, phytomedicine, traditional medicine, and Iran combined with hypertension, blood pressure and antihypertensive were searched for in Web of Science, PubMed, Scopus, International Science Citation Center, and Magiran. Duplicate articles and the articles with no accessible full text were excluded from analysis.

The present study indicated that Iran's people of different cultures and in various regions such as Lorestan province, Alamut mountainous in Ghazvin province, Kerman province, Kohghiluyeh va Boyer Ahmad province, Turkmen Sahra in north of Iran, Chaharmahal va bakhtiyari province, hormozgan province, Arjan in Fars province and Mashhad province totally use 47 medicinal plants from 24 families according in traditional medicine to specifically treat hypertension. Most of the identified plants were from Asteraceae, Lamiaceae and Rosaceae family (figure1). Table 1 gives further data on the medicinal plants effective on hypertension disease.

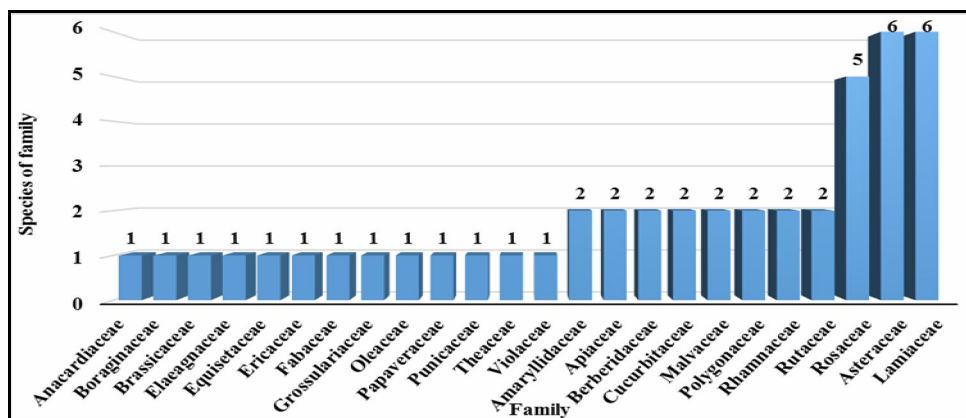


Fig 1: Plant species effective on hypertension in each family

**Table 1: Medicinal plants effective on hypertension diseases in different subcultures and regions of Iran**

No.	Scientific Name	Family	Local Name	Used Organs	Regions	Ref.
1	<i>Marrubium anisodon</i> K. Koch	Lamiaceae	It-sieg, narfiz, yol-ghutli	Stems, Leaves	Turkmen Sahra, north and Hezar Mountain, South East of Iran	[51, 52]
2	<i>Rosa hemispherica</i> J. Herrmenn (AG 386)	Rosaceae	Eit-butni	Fruits	Turkmen Sahra, north of Iran	[51]
3	<i>Hippophae rhamnoides</i>	Elaeagnaceae	<i>Kaham</i>	<i>Fruits</i>	Alamut mountainous in Ghazvin province	[53]
4	<i>Viola odorata</i>	Violaceae	<i>Banafshe</i>	<i>Flowers</i>	Alamut mountainous in Ghazvin province	[53]
5	<i>Hausknechtia elymaitica</i> Boiss.	Apiaceae	Kelos-e kuhi	Aerial parts	Kohghiluyeh va Boyer Ahmad province	[54]
6	<i>Achillea wilhelmsii</i> K.Koch.	Asteraceae	Berenjas	Flowers	Kohghiluyeh va Boyer Ahmad province	[54]
7	<i>Citrullus colocynthis</i> (L.) Schrad.	Cucurbitaceae	Gorjey-e Abu jahl, Hendevaney e sangi	Seeds	Kohghiluyeh va Boyer Ahmad province	[54]
8	<i>Fumaria parviflora</i> Lam	Papaveraceae	Shah-Tareh	Aerial parts	Kohghiluyeh va Boyer Ahmad province	[54]
9	<i>Allium hirtifolium</i> Boiss.	Amaryllidaceae	Mousir	Bulbs	Chaharmahal va Bakhtiyary province	[55]
10	<i>Melilotus officinalis</i> (L.)	Fabaceae	Aklilolmolk	Leaves	Chaharmahal va Bakhtiyary province	[55]
11	<i>Otostegia persica</i> (Burm.) Boiss.	Lamiaceae	Golgoder, gol khari, khoransh, golder	Leaves, Flowers, Thistles	Hormozgan province	[56]
12	<i>Teucrium pollium</i> L.	Lamiaceae	Kerishk, kalpuru	Flowers, leaves, Seeds	Hormozgan province	[56]
13	<i>Teucrium stocksianum</i> Boiss	Lamiaceae	Kalpure kuhi, krishk daii	Leaves	Hormozgan province	[56]
14	<i>Artemisia dracunculus</i> L.	Asteraceae	Tarkhonii	Stems, leaves	Arjan in Fars province	[57]
15	<i>Silybum marianum</i> (L.) Gaertn.	Asteraceae	KharKhangaloo	Seeds, Flowers	Arjan in Fars province	[57]
16	<i>Rhus coriaria</i> L.	Anacardiaceae	Somagh	Fruits	Mashhad, Razavi Khorasan province	[58]
17	<i>Echium amoenum</i> Fisch. & C.A.Mey.	Boraginaceae	Gole Gavzaban	Flowers	Mashhad, Razavi Khorasan province	[58]
18	<i>Equisetum arvense</i> L.	Equisetaceae	Dome Asb	Aerial parts	Mashhad, Razavi Khorasan province	[58]
19	<i>Vaccinium arctostaphylos</i> L.	Ericaceae	Ghareh Ghat	Fruits	Mashhad, Razavi Khorasan province	[58]
20	<i>Ribes khorasanicum</i> Saghafi & Assadi	Grossulariaceae	Ghareh Ghat	Fruits	Mashhad, Razavi Khorasan province	[58]
21	<i>Hibiscus sabdariffa</i> L.	Malvaceae	Chai Makkeh	Flowers	Mashhad, Razavi Khorasan province	[58]
22	<i>Rheum turkestanicum</i> Janisch.	Polygonaceae	Eshghan	Roots	Mashhad, Razavi Khorasan province	[58]
23	<i>Rosa beggeriana</i> Schrenk	Rosaceae	Nastaran	Fruit	Mashhad, Razavi	[58]

					Khorasan province	
24	<i>Citrus aurantiifolia</i> (Christm.) Swingle	Rutaceae	Limu Amani	Fruits	Mashhad, Razavi Khorasan province	[58]
25	<i>Citrus aurantium</i> L.	Rutaceae	Bahar Naranj	Flowers	Mashhad, Razavi Khorasan province	[58]
26	<i>Camellia sinensis</i> (L.) Kuntze	Theaceae	Chai Sabz	Leaves	Mashhad, Razavi Khorasan province	[58]
27	<i>Matricaria chamomilla</i> L	Asteraceae	Baboneh	Flowers	Mobarakeh, Isfahan province	[59]
28	<i>Olea europaea</i> L	Oleaceae	Zeytun	Fruits, Leaves	Mobarakeh, Isfahan province and Turkmen Sahra, north of Iran	[51, 59]
29	<i>Allium sativum</i> L.	Amaryllidaceae	Sire	Bulbs	Sardasht, Western Azerbaijan province and Mashhad province	[58, 60]
30	<i>Cydonia vulgaris</i> L.	Rosaceae	-	Fruit	Sardasht in Western Azerbaijan province	[60]
31	<i>Crataegus azarolus</i> L.	Rosaceae	Zalzalke zard	Fruits, Flowers, Leaves	Zarivar, Kordestan province	[61]
32	<i>Berberis integerrima</i> Bunge	Berberidaceae	Zereshk Kuhi	Fruits	Sirjan, Kerman province and Mashhad, Razavi Khorasan province	[58, 62]
33	<i>Malva sylvestris</i> L.	Malvaceae	Khatmi	Fruits, Flowers	Sirjan, Kerman province	[62]
34	<i>Punica granatum</i> L.	Punicaceae	Anar, Nar-e Farsi	Fruits, Seeds and Flowers	Sirjan, Kerman province	[62]
35	<i>Achillea millefolium</i> L.	Asteraceae	Boomadaran	Aerial parts	Kerman province	[63]
36	<i>Helianthus annuus</i> L.	Asteraceae	Aftabgardan	Flowers	Kerman province	[63]
37	<i>Citrullus vulgaris</i> Schrad.	Cucurbitaceae	Hendevaneh	Fruits	Kerman province	[63]
38	<i>Ziziphus</i> sp.	Rhamnaceae	Ennab	Fruits, Stems	Maraveh Tappeh Region, North of Iran	[64]
39	<i>Urtica dioica</i> L.	Urticaceae	Chitchiti odghin	Leaves	Maraveh Tappeh Region, North of Iran	[64]
40	<i>Falcaria</i> sp.	Apiaceae	Ghaziaghi	Aerial parts	Maraveh Tappeh Region, North of Iran	[64]
41	<i>Berberis</i> sp.	Berberidaceae	Zereg	Fruits	Maraveh Tappeh Region, North of Iran	[64]
42	<i>Capsella bursa-pastoris</i> (L.)	Brassicaceae	Kise keshish	Aerial parts	Hezar Mountain, South East of Iran and Arjan in Fars province	[52, 57]
43	<i>Crataegus pontica</i> C. Koch	Rosaceae	Zalzalak	Fruits, Leaves	Dehloran and Abdanan Region, Ilam province	[65]
44	<i>Paliurus spina-christi</i> Miller.	Rhamnaceae	Siyah telo	Fruits	Dehloran and Abdanan Region, Ilam province	[65]
45	<i>Rheum ribes</i> L.	Polygonaceae	Rivas	Stems	Dehloran and Abdanan Region, Ilam province	[65]
46	<i>Mentha longifolia</i> (L.) Hudson	Lamiaceae	Nana	Aerial Parts	Hamedan province	[66]
47	<i>Stachys lavandulifolia</i> Vahl.	Lamiaceae	-	Flower	Hamedan province	[66]

The present study indicated that Iran's people from different cultures and in various regions use 47 medicinal plants from 24 families to specifically treat hypertension according to traditional medicine. Most of these plants are from families Asteraceae, Lamiaceae and Rosaceae.

Hypertension is an asymptomatic risk factor for cardiovascular diseases. The causes of hypertension have not yet been identified to date. However, smoking, overweight, physical inactivity, high-salt diet, drinking alcoholic drinks, stress and anxiety, ageing, genetic factors, family history of hypertension, chronic renal disease, disorders of adrenal glands and thyroid can play a role in hypertension.

The effect of medicinal plants in lowering blood pressure have been attributed to different mechanisms: 1. Diuretic property cause hypertension to lower through decreasing blood volume [71]; 2. Hypertension may be lowered through decrease in plasma viscosity [72]; 3. Increasing activity of nitric oxide synthase and relaxing smooth muscles of vessels wall help to lower blood pressure [73]; 4. Serum levels of thromboxane B2 (a stable metabolite of thromboxane A2) decrease because of the use of medicinal plants, which prevents vessels from contracting and therefore blood pressure from escalating [74]; 5. According to some studies, potassium in diet is inversely associated with blood pressure [75]. Some plants contain large amounts of potassium and therefore can cause decrease in blood pressure. Besides that, ACE is a key constituent of renin-angiotensin-aldosterone system and a regulator of blood pressure. Abnormal increase in the expression of this system leads to hypertension. These mechanisms can be considered in screening the medicinal plants used as hypotensive agents according to traditional medicine of Iran.

Most of these plants are from Lamiaceae, Asteraceae and Rosaceae families which contain phenolic compounds and have considerable antioxidant effects [76, 77]. For example, certain flavonoids cause inhibition of ACE in vitro and therefore prevent hypertension [78]. Also these compounds with antioxidant properties can counteract free radicals in the environment and prevent their destructive effects. Hypertension is associated with increase in oxidative stress and since many of the plants presented in this study contain antioxidant activity, their hypotensive effects may be attributable to their antioxidant property [79]. It should be noted that a lot of other plants have antioxidant property [80-91].

## Conclusion

Considering plants used in treating hypertension according to Iranian traditional medicine, researchers are recommended to investigate the plants from these families, whose effects on hypertension diseases have been less frequently investigated, to develop hypotensive herbal drugs.

## Conflict of Interests

There is no any conflict of interest.

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