



REVIEW ARTICLE

Exploring Cardiac Tonic Medicinal Plants: An Ethnobotanical Perspective from Iran with Insights into Their Mechanisms of Action

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ABSTRACT: Medicinal plants have been valued for centuries in both traditional and modern medicine for their potential to support cardiovascular health. This review aims to identify and document the medicinal plants known for their cardiotonic effects within the ethnobotanical knowledge of Iran. To gather information on medicinal plants with potential cardiotonic properties, this review utilised reputable databases such as Google Scholar, SID, Scopus, ISI, and Magiran. Key search terms included ‘medicinal plants,’ ‘cardiac tonic,’ and ‘ethnobotany,’ along with their English equivalents. The selected articles underwent a rigorous screening process based on criteria such as publication within the past fifteen years, unrestricted access, and detailed information on the effects of plants on cardiac health. The findings revealed that medicinal plants such as *Ammi visnaga*, *Achillea wilhelmsii*, *Descurainia sophia*, *Leonurus cardiaca*, *Plantago major*, *Cannabis sativa*, *Nerium oleander*, *Allium ampeloprasum*, *Rubus sanctus*, *Verbena officinalis*, *Rheum ribes*, *Pistacia khinjuk*, *Leonurus cardiaca*, *Crataegus monogyna*, *Biebersteinia multifida*, *Hypericum perforatum*, *Melissa officinalis*, and several others are used as cardiac tonics in various regions of Iran. This review highlights that Iranian ethnobotanical knowledge offers a valuable repository of information on medicinal plants with cardiotonic properties. Historically utilised in traditional Iranian medicine, these plants have the potential to support heart health and enhance cardiovascular function through a range of mechanisms.

INTRODUCTION

Cardiovascular diseases are among the leading causes of mortality worldwide [1]. This category encompasses conditions such as coronary artery disease, heart attacks, heart failure, arrhythmias, and peripheral vascular disease [1]. Today, cardiovascular diseases have emerged as one of the most significant causes of death globally [2]. With the rise of modern lifestyles and risk factors such as unhealthy

diets, physical inactivity, and stress, the need for effective preventive and therapeutic strategies to maintain heart health and improve blood circulation is more critical than ever (3). The pathophysiology of heart diseases results from a combination of infectious and non-infectious factors that lead to damage to cardiac and vascular tissues [2]. Non-infectious factors, such as high blood pressure,

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diabetes, elevated cholesterol levels, obesity, and smoking, contribute to oxidative stress and chronic inflammation, resulting in the degradation of vascular walls and the formation of atherosclerotic plaques [3]. In contrast, infectious agents, such as viruses and bacteria, can directly attack cardiac muscles, leading to inflammation, myocarditis, or damage to the inner lining of the heart (endocarditis). Infections may also trigger immune responses that cause further inflammation and degradation of heart tissues [3]. Additionally, other factors, including poor nutrition, a sedentary lifestyle, chronic stress, and genetic predispositions, exacerbate these processes. Collectively, these factors contribute to reduced blood flow, myocardial damage, and impaired cardiac function, ultimately leading to cardiovascular conditions such as angina, heart attacks, and heart failure [3].

Medicinal plants play a crucial role in maintaining cardiovascular health, preventing heart diseases, and strengthening the heart [4]. These plants are effective in reducing blood lipid levels, decreasing blood viscosity, cleansing the arteries, and fortifying the heart muscles, thanks to their antioxidant and flavonoid content [5]. Additionally, these herbal remedies prevent the formation of blood clots and significantly contribute to heart and vascular health [6]. Medicinal plants with cardiotonic properties have been used for centuries in traditional Iranian medicine and other cultures. These plants help strengthen the heart muscles, enhance blood flow, and reduce oxidative stress, all of which are essential for heart health [7]. Cardiotonic tonics are excellent for purifying the blood and arteries and are commonly used to reinforce the heart [8].

Many working individuals experience high levels of stress and anxiety due to work pressures, which can greatly impact heart health [9]. While chemical medications are essential for treating heart diseases, they must be used with caution and under medical supervision to prevent serious side effects [10]. The use of these medicinal plants can serve as a preventive measure against cardiovascular diseases, which remain a leading cause of death worldwide [10]. Some plants, due to their alkaloid and terpenoid compounds, may be beneficial in combating heart diseases

[11]. Indeed, medicinal plants can be valuable in preventing heart diseases and maintaining heart health, thereby improving heart function and acting as cardiotonic agents. Consequently, this study aims to identify and report the medicinal plants recognized in ethnobotanical knowledge as cardiotonic tonics used to strengthen the heart.

MATERIALS AND METHODS

Search strategy

To gather information on medicinal plants with potential cardiac tonic effects, this review utilized reputable databases such as PubMed, Scopus, Google Scholar, and Web of Science. Key terms like 'medicinal herbs,' 'cardiac tonic,' 'heart strengthening,' 'cardiovascular effects of plants,' and 'antioxidants,' along with their English equivalents, were employed in the search. The selected articles underwent a rigorous screening process, adhering to criteria such as publication date within the past ten years, unrestricted access, and substantial information on the impact of plants on cardiac health.

Data analysis

After selecting the final articles, data related to medicinal plants effective on cardiac tonic were extracted from the ethnobotany of different parts of Iran. The obtained information was classified in the form of a table.

RESULTS

The results of the review of ethnobotanical studies in different regions of Iran showed that medicinal plants *Ammi visnaga*, *Achillea wilhelmsii*, *Descurainia sophia*, *Leonurus cardiaca*, *Plantago major*, *Cannabis sativa*, *Nerium oleander*, *Allium ampeloprasum*, *Rubus sanctus*,

Verbena officinalis, *Rheum ribes*, *Pistacia khinjuc*, *Leonurus cardiaca*, *Crataegus monogyna*, *Biebersteinia multifida*, *Hypericum perforatum*, *Melissa officinalis* and many other medicinal plants are used as cardiac tonics in different regions of Iran (Table 1).

Table 1. Cardiac tonic medicinal plants in different parts of Iran based on ethnobotanical knowledge.

Scientific name	Common name	Family	Organ	Traditional uses	Active plant compounds	Mechanism of action for strengthening the heart	Region
<i>Ammi visnaga</i> (L.) Lam	Khella Baldi	Apiaceae	Seed	Sedative, antispasmodic	Chromones, flavonoids	Coronary vasodilator, improves cardiac blood flow	Behbahan [12]
<i>Achillea wilhelmsii</i> C. Koch	Yarrow	Apiaceae	The aerial part	Anti-inflammatory, sedative	Flavonoids, aromatic essential oils	Anti-inflammatory and antioxidant, lowers blood pressure, and enhances cardiac function	Behbahan[12]
<i>Descurainia sophia</i> (L.) Webb & Berth	Flixweed	Brassicaceae	Seed	Cough relief, soothing agent	Flavonoid glycosides	Calming effect, improves circulation	Behbahan [12]
<i>Leonurus cardiaca</i> L	Motherwort	Lamiaceae	The aerial part	Cardiac sedative, heart rhythm regulator	Cardiac glycosides, flavonoids	Regulates heart rate, strengthens heart muscles	Behbahan [12]
<i>Plantago major</i> L.	Great plantain		Seed	Anti-inflammatory, wound healing	Polyphenols, tannins	Anti-inflammatory, enhances blood circulation	Behbahan [12]
<i>Cannabis sativa</i> L.	Cannabis	Canabinaceae	Seed	Pain reliever, sedative	Cannabinoids, terpenoids	Reduces inflammation, improves cardiac blood flow	Dehloran and Abadanan [13]
<i>Nerium oleander</i> L.	Oleander	Apocynaceae	Leaf, flower	Cardiac sedative, heart tonic	Cardiac glycosides, flavonoids	Strengthens heart muscles, increases cardiac contractions	Dehloran and Abadanan [13]
<i>Allium ampeloprasum</i>	Wild leek	Alliaceae	Leaf, Bulb	Lowers blood pressure, anti-inflammatory	Allicin, flavonoids	Lowers blood pressure, strengthens blood vessels	Sareyn [14]
<i>Rubus sanctus</i>	Holy bramble	Rosaceae	Fruit, Leaf	Anti-inflammatory, soothing	Anthocyanins, tannins	Antioxidant, strengthens blood vessels	Sareyn[14]
<i>Verbena officinalis</i> L.	Common vervain	Verbenacea	The aerial part	Sedative, reduces anxiety	Verbenalin, flavonoids	Calming effect, strengthens cardiac vessels	East of Khozestan [15]
<i>Achillea millefolium</i> L	Common yarrow	Asteraceae	The aerial part, Flower	Anti-inflammatory, wound healing, digestive aid	Essential oils (chamazulene, β -caryophyllene), flavonoids, tannins	Anti-inflammatory properties, antioxidant effects, improves circulation and supports cardiovascular health by reducing inflammation and oxidative stress	Meshkin Shahr [16]
<i>Rheum ribes</i> L.	Syrian rhubarb	Polygonaceae	Root	Lowers blood lipids, pain reliever	Anthraquinones, tannins	Reduces blood lipids, improves cardiac blood flow	Meshkin Shahr [16]
<i>Pistacia khinjuc</i> Stocks	Khinjuk	Anacardiaceae	Fruit	Anti-inflammatory, antiseptic	Polyphenols, flavonoids	Anti-inflammatory, enhances blood flow	Abadeh [17]
<i>Leonurus cardiaca</i> L	Motherwort	Labiatae	The aerial part	Cardiac sedative, heart rhythm regulator	Cardiac glycosides, flavonoids	Regulates heart rate, strengthens heart muscles	Arasbaran [18]
<i>Crataegus monogyna</i>	Hawthorn	Labiatae	The aerial part	Lowers blood pressure, heart tonic	Flavonoids, proanthocyanidins	Antioxidant, anti-inflammatory, strengthens heart muscles	Arasbaran [18]
<i>Biebersteinia multifida</i> DC	Adamak	Geraniaceae	Root	Lowers blood pressure, anti-anxiety	Flavonoids, phenolic acids	Calming effect, strengthens cardiac vessels	Raz and Jargalan [19]

<i>Hypericum perforatum</i> L	St John's wort	Hypericaceae	The aerial part	Sedative, antidepressant	Hypericin, flavonoids	Reduces anxiety, improves blood circulation	Raz and Jargalan [19]
<i>Melissa Officinalis</i> L.	Lemon balm	Lamiaceae	The aerial part	Sedative, anti-stress	Aromatic essential oils, flavonoids	Calming, reduces stress, strengthens cardiac function	Raz and Jargalan [19]
<i>Stachys lavandulifolia</i>	Wood betony lamb's ear	Lamiaceae	The aerial part	Anti-anxiety, sedative, anti-inflammatory	Flavonoids, phenolic acids, essential oils	Calming effect, antioxidant properties, reduces oxidative stress on the heart, improves blood circulation	Raz and Jargalan [19]
<i>Melissa officinalis</i> L	Lemon balm	Lamiaceae	Flowering shoot	Calming agent, anti-anxiety, digestive aid	Essential oils (citral, citronellal), flavonoids, tannins	Calming effect on the nervous system, reduces stress and anxiety, improves overall cardiovascular health through stress reduction and vasodilation	Mobarakeh [20]
<i>Matthiola ovatifolia</i> (Boiss.)	Stock	Zygophyllaceae	Flower	Sedative, anti-anxiety	Flavonoids, phenolic acids	Calming effect, strengthens cardiac vessels	Natanz [21]
<i>Ziziphora tenuior</i> L.	Kakuti	Lamiaceae	The aerial part	Lowers blood pressure, anti-inflammatory	Aromatic essential oils, flavonoids	Lowers blood pressure, improves blood circulation	Birjand [22]
<i>Pistacia atlantica</i>	Mt. Atlas mastic tree	Anacardiaceae	Fruit	Anti-inflammatory, antiseptic	Polyphenols, flavonoids	Anti-inflammatory, enhances blood flow	Mashhad [23]

DISCUSSION

Chemical drugs often have adverse effects that can negatively impact patient quality of life [24]. In contrast, herbal remedies fortifying cardiac function are typically associated with fewer side effects due to their natural composition, making them suitable for individuals with pharmacological sensitivities or underlying health conditions [24]. Furthermore, phytotherapeutic agents within traditional medicine can contribute to physiological equilibrium and enhance various bodily systems, potentially serving as adjunctive therapies alongside conventional treatments [25]. Herbal drinks containing antioxidants can prevent blood clot formation and reduce the penetration of blood fats into heart vessels, mitigating the risk of cardiovascular diseases [26]. Many medicinal plants are beneficial for preventing heart disease by regulating blood concentration and preventing blood clots [27]. *Melissa officinalis*, commonly known as lemon balm, exhibits significant cardioprotective properties, enhancing cardiovascular health and reducing the risk of cardiac ailments [28]. Hawthorn plays an effective role in regulating heart rate, increasing heart muscle strength, and reducing blood pressure [29]. Individuals experiencing elevated anxiety and stress are at a higher risk of cardiovascular disease. Cardiotonic botanical species can mitigate stress and anxiety, positively impacting cardiovascular health [30-32]. *Achillea millefolium*, *Cannabis sativa*, and *Tagetes* spp. possess soothing properties that can alleviate stress and anxiety, contributing to improved cardiovascular health [30-32]. The yarrow plant is valuable for treating heart diseases such as heart failure, heart muscle swelling, and heart attack [33]. In traditional medicine, rhubarb is believed to support heart health by reducing bad cholesterol [34]. Chive or wild leek, rich in choline, can aid in heart muscle movement and heart rate regulation [35].

The mechanisms through which medicinal plants exert cardiac tonic effects primarily involve their bioactive compounds. Antioxidant properties, which prevent oxidative damage to heart cells, play a significant role [36]. Medicinal plants are rich in flavonoids and procyanidins,

which neutralize free radicals, preventing myocardial cell damage and improving heart function (37). These compounds also induce coronary artery dilation, leading to increased blood flow to the heart and improved myocardial nutrition [37]. The sedative and anti-anxiety properties of medicinal plants contribute to reduced blood pressure and overall relaxation, thereby reducing the workload on the heart. By inhibiting GABA-decomposing enzymes, these plants enhance the sedative effects of GABA, alleviating mental and physical stress on the heart [37]. Additionally, the anti-inflammatory and soothing properties of medicinal plants can reduce inflammation within blood vessels, further improving heart function. In summary, medicinal plants can strengthen the heart and improve its function through multiple mechanisms, including reducing oxidative stress, dilating blood vessels, relaxing the nervous system, and reducing inflammation.

Ethnobotanical knowledge has played a significant role in the development of new medicines and treatments from ancient times to the present day, and it remains a rich source of innovative ideas (38). This traditional knowledge, recorded through therapeutic practices and historical writings, provides valuable insights into the medicinal properties of plants. Examining this knowledge and documentation helps us gain a deeper understanding of traditional healing methods and how plants are used to enhance health. These historical insights not only hold cultural value but also serve as a scientific foundation for modern research [38]. Throughout history, diverse cultures around the world have utilized medicinal plants to treat ailments and improve health. Among these uses, the role of plants in enhancing cardiovascular health holds a prominent place [39]. In traditional medicine, many plants are recognized as cardiac tonics, which support heart health by improving cardiac function, enhancing blood circulation, and regulating blood pressure. These plants, with their anti-inflammatory, antioxidant, and heart-strengthening properties, contribute significantly to the maintenance and enhancement of cardiovascular health and are considered essential components of natural and

traditional treatments [39]. Integrating traditional knowledge with modern pharmacology can lead to the discovery and development of new drugs. Ethnobotanical studies serve as a resource for identifying plants with potential therapeutic properties that may not have been fully explored in modern research. Many contemporary medications, including those for cardiovascular conditions, have been derived from plants used in traditional medicine [39]. This indicates that traditional knowledge can act as a starting point for research and development of new therapies [40-44]. These plants might offer novel mechanisms to support heart health and improve cardiovascular function, which might not have been uncovered in modern research [45].

CONCLUSIONS

Medicinal plants with cardiac tonic properties can significantly contribute to cardiovascular health, prevent heart diseases, and mitigate the side effects of chemical drugs, offering a natural and effective treatment option. By integrating traditional knowledge with modern scientific advancements, we can develop innovative therapeutic approaches and reduce the incidence of heart diseases. Continued comprehensive and systematic research is essential to fully harness the potential of these natural resources.

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Conflict of interests

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

ETHICAL CONSIDERATION

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

Statements and Declarations

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Consent to participate

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

Author contributions:

OA: Conceptualization, the original draft writing, investigation, writing including reviewing and editing and investigation and formal analysis; AS: Conceptualization, supervision, and project administration; AS and OA: Conceptualization, the original draft writing, investigation, writing including reviewing and editing

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