Herbal cardioprotective practices and pharmacology of folk medicine for heart failure management in Uzbekistan: an integrative review of contemporary evidence

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Abstract

Herbal medicines remain widely used for cardiovascular disease and heart failure (HF) in Uzbekistan, where a rich ethnobotanical tradition coexists with modern cardiology. This narrative review synthesizes data from approximately 30 contemporary publications on folk remedies and pharmacologically characterized medicinal plants relevant to HF, with an emphasis on Central Asian and Uzbek practice. Sources include ethnobotanical surveys, cardiology-focused herbal reviews, and experimental and clinical studies on botanicals such as Crataegus spp., Allium sativum, Terminalia arjuna, Ganoderma spp., and regionally used foods and plants such as apricot, quince, and Atraphaxis pyrifolia. The review outlines mechanisms of action, benefits, dosing where available, adverse effects, drug–herb interactions, and limitations of current evidence. A conceptual framework is proposed that links Uzbekistan's folk uses to global pharmacologic data, highlighting both convergences and critical gaps. Despite promising preclinical and selected clinical signals for improved symptoms and surrogate outcomes, robust HF-specific randomized trials are scarce, and safety reporting is incomplete. Well-designed local studies in Uzbekistan are needed to define effective, safe, and standardized herbal adjuncts to guideline-directed HF therapy.

Keywords: *folk medicine, herbal medicine, heart failure, cardiovascular disease, Uzbekistan, pharmacology, ethnobotany, hawthorn, apricot*

Introduction

Heart failure is a major global public health problem, representing the final common pathway of multiple cardiovascular diseases and causing substantial morbidity and mortality worldwide. In response to this burden, herbal medicines are widely used as complementary or adjunctive therapies for cardiovascular conditions, including congestive heart failure, hypertension, angina, arrhythmias, and atherosclerosis. Reviews have highlighted plants such as garlic, guggul, hawthorn, and Terminalia arjuna as possessing cardiotonic, vasodilatory, antioxidant, and lipid-lowering properties with at least preliminary clinical or experimental support.[1][2][3][4][5][6][7]

Uzbekistan is characterized by a highly diverse flora with more than 4,500 vascular plant species, of which over 600 are documented as medicinal and many are used in folk cardiovascular indications. Ethnobotanical fieldwork has recorded over 100

medicinal plants applied across Uzbek communities, including species used to support "heart activity" and blood circulation, such as Atraphaxis pyrifolia. Qualitative health-policy work further shows that Uzbek primary care physicians and patients commonly employ folk remedies such as dried apricot, vegetable juices, thyme broth, boiled quince leaves, and plantain alongside biomedical HF therapies. However, the extent to which such local practices align with pharmacologically validated herbal cardioprotective mechanisms remains largely unexplored in a structured way.[8][9][10][11]

This review aims to bridge that gap by integrating ethnobotanical and clinical pharmacology data relevant to herbal management of HF in Uzbekistan. Specifically, we: (1) summarize the epidemiologic and health-system context of HF and complementary medicine use; (2) describe key medicinal plants and foods used for cardiac support; (3) synthesize pharmacologic, experimental, and clinical evidence for selected botanicals with potential relevance to HF; (4) discuss safety, interactions, and limitations; and (5) outline research priorities for Uzbekistan. By aligning folk practice with contemporary pharmacology, this article seeks to support rational, evidence-informed incorporation of herbal medicines as adjuncts—not substitutes—to guideline-directed HF care.

Methods

This narrative review was conceptualized to reflect a typical IMRAD structure, with an emphasis on qualitative synthesis rather than formal meta-analysis. We used keyword-based electronic searches in major databases (PubMed, Scopus, Google Scholar) and open-access ethnobotanical journals with combinations such as "Uzbekistan medicinal plants cardiovascular," "herbal medicine heart failure," "folk remedies heart Uzbekistan," "Crataegus heart failure clinical trial," and "Terminalia arjuna congestive heart failure." Additional searches targeted macrofungi, foods, and regionally important taxa (e.g., "apricot cardiovascular potassium," "quince cardiotonic folk medicine," "Ganoderma cardiovascular Uzbekistan").[4][8][9][10][12][7][13]

Inclusion criteria for the "core set" of approximately 30 publications were: (1) primary or review articles on medicinal plants or folk remedies with relevance to cardiovascular disease or HF; (2) ethnobotanical or ethnopharmacological studies from Uzbekistan or Central Asia describing cardiac indications; and/or (3) experimental or clinical pharmacology studies on specific plants used in Uzbek practice. Papers on Chinese herbal medicine and other traditions were included when they provided mechanistic or clinical data on botanicals also used or potentially cultivable in Uzbekistan (e.g., Crataegus spp., Ganoderma spp.). Articles dealing solely with non-cardiovascular outcomes or without clear botanical identification were excluded.[14][2][15][9][10][12][7][4]

Data extracted included plant or product name, part used, traditional indication, experimental models, clinical endpoints, dosing, adverse effects, and known drug–herb

interactions when described. Given the heterogeneity and limited number of HF-specific trials, formal statistical pooling was not attempted. Instead, we organized findings thematically by type of remedy: (1) Uzbekistan-specific folk plants and foods; (2) globally studied "cardiovascular herbs" relevant to HF; and (3) macrofungi with cardiometabolic activity. A conceptual "results figure" and comparative table summarize modes of action, putative benefits, side effects, limitations, and typical dosage ranges as derived from these sources.[1][9][10][12][7][4]

Results

Folk cardiovascular remedies in Uzbekistan

Ethnobotanical surveys indicate that Uzbekistan hosts an exceptionally rich medicinal flora, with about 600 species documented for therapeutic use and 117 commonly employed in everyday practice across 45 plant families. Among these, several taxa and food plants are specifically associated with cardiovascular or "heart-strengthening" uses, often based on oral tradition rather than controlled trials. For example, Atraphaxis pyrifolia leaf infusions are used in certain districts of Samarkand and Navoi for cardiovascular diseases, insomnia, and as a sedative to "improve heart activity and blood circulation." Broader reviews of medicinal plants in the region also mention herbs used for hypertension and circulatory disorders, reflecting a strong overlap with HF risk factors.[9][10][11][16]

Qualitative research on chronic heart failure (CHF) management in Uzbek primary care reveals that physicians and patients commonly integrate folk remedies with prescribed cardio-protectors and standard HF medications. Widely reported traditional remedies include dried apricot (often as a potassium-rich snack), mixed vegetable juices (carrot, peppers, beet), thyme broths, boiled quince tree leaves, and plantain chewing, sometimes complemented by more invasive practices like leeching. Although these practices do not generally replace biomedical therapy, they are used concurrently and are "left over from earlier regimes," raising questions about potential interactions, dosage variability, and the need for structured guidance within HF management pathways.[8]

Regionally important food plants with cardiotonic reputation

Dried apricot (Prunus armeniaca) is widely used across Central Asia and neighboring regions as both food and medicine, and is frequently recommended in folk practice for "heart weakness," chronic kidney disease, and as a dietary adjunct in cardiovascular disease. Its high potassium content is cited as a rationale for supporting cardiovascular function and modulating sodium balance in hypertension and HF, although clinical trials specifically in HF populations are lacking. Quince (Cydonia oblonga) fruits and seeds are also described in regional and neighboring folk medicine as supportive in strong cough, gastrointestinal inflammation, and in "increasing cardiovascular activity," with syrup and decoctions used for chronic cardiopulmonary symptoms.[8][17][13]

From an Avicenna-inspired traditional perspective, food plants such as apple, amla jam, quince syrup, and rose water are considered cardiotonic and suitable for regular consumption without major side effects. While these products likely contribute micronutrients, antioxidants, and favorable electrolyte profiles, their direct HF-modifying effects have not been rigorously quantified. Experimental studies on polyphenol-rich fruits and juices in other contexts show improvements in vascular function and oxidative stress markers, but extrapolation to clinically meaningful HF outcomes in Uzbek populations remains speculative. This underscores the need for targeted nutritional and phytochemical research on these culturally embedded remedies.[18][7][17]

Medicinal plants with documented cardiovascular pharmacology

Global reviews of herbal medicine for cardiovascular disorders converge on a set of botanicals with notable experimental and clinical data, many of which are accessible in or adaptable to Uzbek practice. These include garlic (Allium sativum), hawthorn (Crataegus spp.), guggul (Commiphora wightii), and Terminalia arjuna, among others. A seminal review highlights their use for centuries in ischemic heart disease, congestive heart failure, arrhythmias, and hypertension, with modern research confirming actions such as antioxidant effects, improved myocardial perfusion, positive inotropy, and lipid lowering.[1][3][4][5][7]

Hawthorn extracts represent one of the most extensively studied herbal therapies in chronic HF. Randomized clinical trials have demonstrated improvements in HF symptom scores, exercise tolerance, and left ventricular remodeling parameters, although effects on mortality remain unproven and optimal dosing is uncertain. In one synthesis, hawthorn is described as exerting antioxidant, anti-inflammatory, vasodilatory, antiarrhythmic, and lipid-lowering actions, while also increasing myocardial contractility and normalizing left ventricular chamber volume in HF animal models. Terminalia arjuna bark has shown efficacy in congestive cardiac failure, chronic stable angina, and hypertension in small clinical studies, likely via antioxidant and cardioprotective mechanisms, though again robust HF-specific trials are limited.[19][3][4][5]

Garlic and guggul are primarily valued for lipid-lowering, antiatherosclerotic, and mild antihypertensive effects, thereby addressing upstream risk factors for HF rather than systolic function per se. Chinese herbal medicine literature, while culturally distinct, adds further candidates, with multi-herb formulations tested in chronic HF, often showing improvements in symptoms and surrogate endpoints when added to standard therapy. These trials, however, frequently involve complex formulas and syndrome-based prescriptions that may not be directly transferable to Uzbekistan without adaptation and standardization.[14][2][4][15][18]

Medicinal macrofungi and cardiovascular protection

Recent ethnomycological work in Uzbekistan documents the use of locally available macrofungi as medicinal resources, including species of Ganoderma. Ganoderma

adspersum, for example, is reported to be used for hypertension and cardiovascular diseases among other indications, and is associated with antiatherosclerotic, anti-inflammatory, antioxidant, and hepatoprotective activities based on broader pharmacologic literature. Although most Ganoderma research focuses on metabolic, hepatic, and oncologic endpoints, its antioxidant and endothelial-modulating properties suggest potential relevance for HF, which is strongly influenced by systemic inflammation and oxidative stress.[15][12]

To date, HF-specific clinical data on macrofungi are sparse, and nearly all evidence derives from preclinical models or non-cardiac clinical settings. Nonetheless, the combination of local cultural acceptance, oral formulations (teas, decoctions), and plausible mechanisms may justify exploratory use as adjuncts under careful pharmacovigilance within research protocols in Uzbekistan.[12][15]

Comparative overview of selected herbal and food remedies relevant to heart failure

Table 1 summarizes key features of representative herbal medicines and folk foods that are either documented in Uzbekistan or globally recognized for cardiovascular benefits, with emphasis on HF-related pharmacology, safety, and evidence gaps.

Table 1. Selected herbal and food-based remedies with potential relevance to heart failure

Herb/food (common use)	Main mechanisms relevant to HF	Typical dosage range reported	Potential benefits in HF context	Adverse effects & interactions	Key limitations of evidence
Hawthorn (Crataegus spp.; cardiotonic)	Antioxidant; positive inotrope; vasodilator; antiarrhythmic; improves LV remodeling in models[19][4][5]	Extracts 160–900 mg/day in divided doses in trials; exact optimal dose unclear[19][5]	Improved symptom scores and exercise tolerance in mild–moderate HF; possible LV function support[19][4][5]	May potentiate digitalis effects; potential for hypotension with antihypertensives; GI upset, dizziness reported[1][19]	Limited data on mortality and hospitalization; heterogeneous preparations and dosing; few large RCTs[19][4]
Terminalia arjuna (bark; cardioprotective)	Antioxidant; anti-ischemic; mild positive inotrope; endothelial protection[3][4]	Decoctions or standardized extracts, often 500–1500 mg/day in small trials[3]	Improved symptoms and exercise capacity in congestive cardiac failure and angina; possible BP reduction[3]	GI discomfort, headache; theoretical interaction with conventional cardioactive drugs[3][4]	Trials small and often non-blinded; HF endpoints not standardized; no large multicenter studies[3]
Garlic (Allium sativum;	Lipid lowering; antiplatelet;	600–1200 mg/day dehydrate	May reduce atherosclerotic progression	Increased bleeding risk with anticoagulants/anti	Few HF-specific trials; effects

cardiovascular risk)	antihypertensive; antioxidant[4][5][18]	d powder or aged extract in studies[4][7]	and BP, indirectly lowering HF risk; modest impact on symptoms[4][18][7]	platelets; GI irritation; odor[1][20]	mainly on risk factors; variability between preparations[4][7]
Guggul (Commiphora wightii; lipid-lowering)	Hypolipidemic; antiatherosclerotic; anti-inflammatory[3][4][18]	Doses equivalent to 25–50 mg guggulsterones 2–3 times daily in some studies[18]	Potential reduction in atherosclerotic burden and HF risk factors; limited symptom data[3][18]	GI upset; possible thyroid stimulation; interactions with statins and other lipid-lowering drugs[18][7]	Limited cardiovascular outcome data; not HF-specific; quality control challenges[18][7]
Dried apricot (Prunus armeniaca; folk "heart strengthener")	High potassium; fiber; antioxidants; supports Na–K balance and vascular function[8][13]	Folk use: handfuls or small bowls daily as food; no standardized therapeutic dose[8][13]	May support BP control and reduce edema via potassium and osmotic effects; nutritional support in HF[13]	Risk of hyperkalemia in HF patients on RAAS inhibitors or MRAs; high sugar load may worsen glycemic control[20][13]	No HF-targeted clinical trials; benefits inferred from general nutrition data and folk use[8][13]
Quince (Cydonia oblonga; cardiotonic syrup, leaf decoctions)	Antioxidant; mild vasomodulatory; mucilaginous seeds soothe airways and GI tract[17][13]	Syrups and decoctions; typically several spoonfuls to cups daily in folk practice[17][13]	Symptomatic relief of cough and chest discomfort; potential improvement of general cardiovascular "tone"[17][13]	Generally safe; excessive syrups may add sugar load; minimal interaction data[17]	Lack of HF-specific pharmacology and trials; cardiotonic claims largely traditional[17][13]
Atraphaxis pyrifolia (leaf infusion; Uzbekistan folk heart remedy)	Folk indication: improves heart activity and circulation; likely polyphenol-rich[9]	Infusions of leaves; quantities not standardized, taken as tea[9]	Hypothetical vascular and mild cardioprotective effects based on circulation indications[9]	Safety and interactions unknown; risk of adulteration or misidentification[9][10]	No pharmacologic or clinical HF data; evidence restricted to ethnobotanical reports[9]
Ganoderma spp.	Antiatherosclerotic; antioxidant;	Teas, powders, or	Potential improvement of endothelial	Possible hepatotoxicity at high doses;	Very limited cardiovascular and HF

(macrofungus; tonic)	anti-inflammatory; metabolic modulation[12]	extracts; doses vary widely in traditional use[12]	function and risk-factor profile; theoretical cardioprotection[15][12]	interactions via cytochrome modulation; allergy[12][7]		trials; effects inferred from broader pharmacology[15][12]

Conceptual figure: Mechanistic pathways of herbal cardioprotection in heart failure

A conceptual results figure for integration into a Word file could depict the main mechanistic pathways by which herbal and food-based remedies may influence HF outcomes in the Uzbek context. Based on the reviewed literature, such a figure would include five major nodes: (1) myocardial contractility and remodeling; (2) vascular tone and endothelial function; (3) neurohormonal modulation; (4) oxidative stress and inflammation; and (5) metabolic and renal support. Arrows could connect hawthorn and Terminalia arjuna primarily to improved contractility and remodeling; garlic, guggul, and Ganoderma to vascular, metabolic, and anti-inflammatory effects; and apricot and quince to electrolyte balance, antioxidant support, and symptom-modifying actions.[19][3][4][5][15][18][12][13]

In the same figure, a second layer could map potential risks: hyperkalemia (apricot) intersecting with RAAS blockade; bleeding risk (garlic) overlapping with anticoagulant therapy; hypotension (hawthorn, arjuna) interacting with ACE inhibitors and beta-blockers; and hepatotoxicity (Ganoderma) intersecting with statins or other hepatically metabolized drugs. The figure would visually emphasize that these botanicals act predominantly as adjunctive modulators of pathways already targeted by standard HF drugs, reinforcing the importance of coordinated prescribing and monitoring in Uzbek clinical practice.[1][20][12][19]

Discussion

This review suggests that Uzbekistan's rich tradition of herbal and food-based remedies for heart disease coexists with, and in some areas anticipates, pharmacologic insights emerging from global cardiovascular herbal research. Ethnobotanical data confirm widespread use of plants such as Atraphaxis pyrifolia and common foods like dried apricot and quince for heart-related complaints, often alongside biomedical therapy. These practices mirror broader regional traditions that emphasize cardiotonic foods, aromatic herbs, and macrofungi to support circulation, blood quality, and resilience against chronic disease. However, the translation from traditional indications to modern HF endpoints is incomplete and uneven, with major gaps in dosing, standardization, and safety characterization.[4][8][9][10][12][17][13]

International literature on hawthorn, Terminalia arjuna, garlic, and other herbs provides a stronger evidence base, including randomized trials and mechanistic studies that align well with HF pathophysiology. For instance, hawthorn's positive inotropic,

antioxidant, and vasodilatory actions plausibly contribute to symptom relief and improved left ventricular performance in mild to moderate chronic HF, though definitive impacts on mortality and hospitalization remain unproven. Similarly, T. arjuna has demonstrated benefits in small studies on congestive cardiac failure and angina, suggesting potential as an adjunctive therapy in settings where it is culturally acceptable and accessible. These data support the idea that certain botanicals, if standardized and monitored, could be rationally incorporated into Uzbek HF management, particularly to address residual symptoms and quality-of-life concerns.[19][3][5][4]

At the same time, safety concerns and interaction risks are non-trivial. HF patients frequently receive polypharmacy including ACE inhibitors or ARNI, beta-blockers, mineralocorticoid receptor antagonists, diuretics, and anticoagulants; adding herbs like garlic (antiplatelet), hawthorn (inotropic/vasodilator), or high-potassium dried apricot can meaningfully alter coagulation, blood pressure, and electrolyte balance. Reports on herbal product use in cardiovascular patients emphasize that many do not disclose supplement intake, increasing the risk of unrecognized interactions and adverse events. In Uzbekistan's mixed system—where folk remedies are common but clinical documentation of them is sparse—this underlines the need for structured history-taking, patient counseling, and pharmacovigilance in HF clinics.[1][20][7][13][19]

Methodologically, current evidence is constrained by heterogeneity in herbal preparations (whole plant, extracts, teas), variable quality control, and a paucity of HF-specific randomized controlled trials, particularly within Central Asia. Most data on globally studied herbs derive from Europe or Asia (notably China and India), and may not fully reflect the genetic, dietary, and healthcare contexts of Uzbek patients. Moreover, many ethnobotanical publications from Uzbekistan document presence and use rather than outcome or safety data, leaving clinicians without clear guidance on clinical efficacy or dosing. Addressing these gaps will require multidisciplinary collaboration among cardiologists, pharmacologists, ethnobotanists, and bioinformaticians to design context-appropriate RCTs and observational studies.[14][2][3][15][9][10][7][11][4]

For practice and policy, a pragmatic approach in Uzbekistan could include: (1) systematically recording herbal and food-based folk remedies used by HF patients in clinical records; (2) prioritizing research on a limited set of promising botanicals (e.g., hawthorn, T. arjuna, locally available Crataegus species, dried apricot, Ganoderma spp.) with HF-relevant mechanisms; and (3) developing clinical guidelines that explicitly address interactions, contraindications, and monitoring requirements when folk remedies are combined with guideline-directed HF therapy. A parallel focus on quality control, including botanical identification, contaminant screening, and standardization of active constituents, is essential to ensure reproducible benefits and minimize harm. In this sense, Uzbekistan's strong ethnobotanical base and emerging

pharmacologic literature provide an opportunity to develop model integrative HF care pathways rooted in local culture yet governed by rigorous clinical science.[8][12][7][19][4]

Conclusion

Uzbekistan's folk medicine offers a diverse portfolio of herbal and food-based remedies for heart complaints and heart failure, ranging from potassium-rich dried apricot and cardiotonic quince preparations to leaf infusions of Atraphaxis pyrifolia and medicinal macrofungi. When viewed through the lens of contemporary pharmacology, several of these practices converge with globally studied botanicals such as hawthorn, Terminalia arjuna, garlic, and Ganoderma species that demonstrate plausible HF-related benefits in preclinical and early clinical work. However, the evidence base remains incomplete, with few robust HF-specific trials, limited safety and interaction data in polytreated patients, and substantial variability in preparation and dosing. For clinicians and researchers in Uzbekistan, the priority is not to replace guideline-directed HF therapy with herbal remedies, but to characterize, standardize, and safely integrate the most promising traditional agents as adjuncts, guided by rigorous clinical trials and pharmacovigilance. Such an approach could transform a rich ethnomedical heritage into an evidence-informed component of modern HF management, tailored to the cultural and health-system realities of the region.

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