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A Review of Medicinal Plants for Blood Purification: Efficacy and Therapeutic Properties

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A B S T R A C T

Blood plays a vital role in the body, carrying oxygen, nutrients, and hormones. Therefore, blood purification is of great importance and guarantees the proper functioning of the body. Medicinal plants have been used by people for the treatment of various diseases in the past. Due to the high side effects of the use of different chemical drugs, in recent years, medicinal plants have been relatively popular. Therefore, in this review, using the keywords of medicinal plants, purification, and blood purification, numerous articles published in this field were searched through Scopus, Google Scholar, Irandoc.ac.ir, and Sid. ir databases. Finally, 87 articles were selected and reviewed. A list of plants effective in blood purification along with their effective ingredients and other therapeutic properties was obtained. According to the results, 45.2% of plants effective in blood purification were native to Iran. Fabaceae, Asteraceae, and Lamiaceae were the most important families, respectively. Plants effective in blood purification can help improve health and purify the blood. Still, the consumption of each plant should be according to the condition of each person's body and consult with a specialist.

Keywords: Fabaceae, Blood purification, Iran, Fennel

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Introduction

Blood is the body's vital fluid, which carries important tasks such as carrying oxygen and nutrients to cells, removing toxins and waste products, regulating body temperature, and fighting infections. Blood is a type of specialized connective tissue that constitutes 7-8% of body weight so that its volume in an adult person reaches 5 liters on average. Due to its flow in blood vessels, this tissue is the main factor in the distribution of food, the transfer of oxygen and carbon dioxide, and the waste products resulting from the activity of cells to the excretory organs. The blood liquid, which is called plasma, plays a role in supplying cells with nutrients such as glucose, fatty acids, and amino acids, and removing waste materials such as carbon dioxide, lactic acid, and urea. The removal of waste and toxic substances from the body and the placement of nutrients at a suitable and balanced level are necessary for health and life preservation; Because not excreting these compounds changes the composition of the cells and creates unfavorable conditions for the continuation of life [1]. Blood is connected to organs such as kidneys, lungs, and liver for purification and elimination of toxins. For example, the kidneys regulate the blood in terms of minerals such as sodium, potassium, and solutes, and help purify the blood by excreting waste through urine. In addition to the kidneys, the liver also plays a significant role in blood purification due to its ability to detoxify and expel unwanted substances into the bile [2]. Some factors such as improper diet, excessive drug use, stress, air pollution, and unhealthy lifestyle can negatively affect the function of the liver and kidneys, and as a result, blood purification cannot be done completely. In these conditions, the use of medicinal plants can be useful as a natural solution to purify the blood and help the functioning of the liver and kidneys; therefore, people should take care to maintain the health of these organs to prevent many diseases caused by their dysfunction. From ancient times to today, traditional medicine has been used to purify the blood and improve the function of these organs, which has received much attention in recent years.

In modern medicine, methods such as hemodialysis, hemodiafiltration, hemofiltration, etc. are used. The knowledge related to medicinal plants and many important treatments of various diseases has continued its way in this medicine for many centuries so nowadays most people have turned to traditional medicine and the use of medicinal plants to treat their diseases. Of course, today's people's sufficient information about the different parts of the human body compared to the people of ancient times is not ineffective in using plants more effectively. In traditional medicine, many medicinal plants have been used to purify the blood with direct or indirect effects through blood-purifying organs [3]. Recent research shows that the compounds found in medicinal plants, including dietary fibers, flavonoids, vitamins, and antioxidant compounds, have dramatically increased the healing power of plants, including blood filtration and improving the functioning of effective organs in this field [4]. Statistics reported by the World Health Organization (WHO) show that 20,000 species of medicinal plants have been found in the world, which more than 80% of the world's people use to improve their health and treat many complications [5]. A review of medicinal plants effective on blood purification is important due to helping to identify natural sources, help to traditional treatments, reduce the side effects of chemical treatments and their time-consuming nature, and development of new and more effective drugs. This type of study can lay the foundation for further research in the fields related to medicine, pharmacy, and plant sciences. So, the purpose of this study is to introduce medicinal properties in blood purification that can help to expand scientific knowledge, improve public health, and develop natural therapies.

Materials and methods

This review article has been done in a library format. For this purpose, a search was conducted using the keywords of medicinal plants, treatment, traditional medicine, and blood purification in different scientific websites such as Scopus, Google Scholar, PubMed, Irandoc.ac.ir, sid.ir, Web of

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Science, and Scopus. In this way, at first, the abstracts of the searched articles between 2002 and 2024 were reviewed and the studies related to the study objectives were selected. Finally, 87 eligible articles were reviewed. Among them, 21 articles were reviewing type. The scientific names of the plants and their geographical distribution are written based on the POWO website.

Results and Discussion

In this study, 42 plants effective in cleansing and purifying blood have been introduced, of which 19 (45.2%) are native to Iran. Most of the families used included Fabaceae, Asteraceae, and Lamiaceae, respectively (Table 1). The therapeutic properties and other medicinal information of each of them are also presented in Table 1.

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Table 1. The list of effective medicinal plants in blood purification.

Scientific name	Common name	Family	Plant parts used	Mode of Utilization	Other therapeutic use	Phytochemical compounds
Allium sativum L.	Garlic	Amaryllidaceae	Bulb and leaves	Extract	Increasing blood circulation, reducing cholesterol, lowering blood pressure, strengthening the immune system, purifying the blood, anti-inflammatory, anti-cancer, antiviral, antifungal, preventing Alzheimer's, treating kidney and urinary infections, [6].	tannins, flavonoids, saponins and alkaloids, allicin [7].
Punica granatum L.	Pomegranate	Punicaceae	Fruit	Solid	Reducing blood sugar and cholesterol, blood pressure regulation, liver, kidney, and digestive protection, Alzheimer's and obesity treatment, bacterial infections, cardiovascular diseases, infertility [8].	alkaloids, anthocyanidins, tannins, flavonoids, phenolics, proanthocyanidins, sterols, terpenes, terpenoids, xanthonoids, fatty acids, organic acids, lignans, saccharides, and vitamin C [9].

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Senegalia chundra **(Roxb. ex Rottler) Maslin**	Cutch tree	Fabaceae	Stem	Solid	Anticancer, anti-inflammatory, reduce bleeding, and protect the liver [10]. Antidiarrheal, antitussive, treatment of skin rashes, mouth ulcers, bedsores, dental infections, and sore throat [11]. Reduces blood sugar, antibacterial and fungal [12].	Acacetin, chrysin, diosmetin, myricetin, kaempferol, isorhamnetin, naringenin, taxifolin, quercetin, rutin, gallic acid, catechin, chlorogenic acid, epicatechin, caffeic acid, coumaric acid, umbelliferone, and ellagic acid [13].
Berberis sp.	Common barberry	Berberidaceae	Fruit, leaves, root	Powder, Juice	Antioxidant, Opener of liver and bile ducts, laxative, elimination of toxins and waste materials, treatment of jaundice. Nausea and vomiting, removal of kidney stones, protector and tonic for the liver and heart, pain reliever, vasoconstrictor [14; 15].	alkaloids, tannins, phenolic compounds, sterols, and triterpenes [16].
Carthamus tinctorius L.	Safflower	Asteraceae	Flower	Extract	Antibacterial, analgesic, anti-inflammatory, liver and lung protection, strengthening the immune system, regulating blood pressure, regulating heart rate, reducing blood	Carthamidin, isocarthamidin, hydroxysafflor yellow A, safflor yellow A, safflamin C, and luteolin [18].

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					cholesterol, and reducing blood sugar [17].	
Curcuma longa L.	Turmeric	Zingiberaceae	Rhizome	Powder	Reducing bad cholesterol (LDL), increasing good cholesterol (HDL), treating Alzheimer's, lowering blood sugar, strengthening the immune system Regulation of blood pressure, jaundice, cardiovascular diseases, digestive diseases, anti-cancer, anti-cirrhosis of the liver, treatment of biliary disorders, rheumatism, sinusitis, treatment of stomach ulcers, blood pressure, anti-coagulation, anti-bacterial, anti-fungal [19;20].	curcumin (77%), desmethoxycurcumin (17%), bis-desmethoxycurcumin (3%) and cyclocurcumin (a minor constituent [19].
Indigofera tinctoria L.	True indigo	Fabaceae	Leaves	Decoction	Antidiabetic, antibacterial, anticancer, anti-inflammatory, liver protector, anticonvulsant, pain reliever, treatment of constipation, liver diseases, heart palpitations, gout, diarrhea, and heat stroke [21].	Flavonoids, alkaloids, glycosides, and terpenoids [22].

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Lawsonia inermis L.	Henna Tree	Lythraceae	Flower, leaves	Decoction	Anti-viral, anti-fungal, anti-bacterial, anti-pain, anti-inflammatory, blood purifier, anti-skin diseases, and anti-cancer [23].	flavonoids, tannins, and naphthoquinone derivatives [23].
Foeniculum vulgare Mill.	Common fennel	Apiaceae	Whole plant	Infusion	Treatment of digestive diseases, eye conjunctivitis, laxatives, analgesic, antispasmodic, antiflatulent, kidney stone removal, sore throat treatment, stomach pain reducer, and antioxidants [24].	trans-anethole, fenchone, estragol (methyl chavicol), and α-phellandrene [24].
Zingiber officinale Roscoe	Common Ginger	Zingiberaceae	Rhizome	Decoction	Liver blockage opener, stomach and intestinal bloating reliever, body disinfectant, antifungal, diarrhea reliever, diuretic, appetite stimulant, antibacterial, laxative and laxative, antispasmodic [25].	Alkaloids, glycosides, anthraquinone glycosides, cardiac glycosides saponins, tannin, phenol, flavonoid, steroids, terpenoids, protein and carbohydrates [25].
Urtica dioica L.	Common stinging nettle	Urticaceae	Whole plant	Decoction	Treatment of hay fever, arthritis, diarrhea, anemia, anti-inflammatory, antipyretic, blood sugar reducer, blood thinner, kidney stone removal [26].	phenolic compounds, sterols, fatty acids, alkaloids, terpenoids, flavonoids, and lignans [26].

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Justicia adhatoda L.	Malabar nut	Acanthaceae	Flower, leaves	Decoction	Treatment of cough, asthma, diarrhea, malaria, relief of inflammation and joint pain, antispasmodic, immune system booster, antiallergic, blood sugar reducer, antifungal, and antimicrobial [27].	alkaloids, flavonoids, glycosides, tannins, proteins, phenols, and resins in acetone, methanol, ethyl acetate, and chloroform [28].
Abutilon indicum (L.) Sweet.	India Abutilon	Malvaceae	Leaves and flowers	Powder	anti-oxidant, anti-bacterial, analgesic, anti-inflammatory, anti-cancer, hepato-protective, immuno-mod- adulatory and larvicidal activities [29].	alkaloids, steroids, flavonoids, terpenoids, phenols, tannins, carbohydrates, and amino acids [30].
Achyranthes aspera L.	Prickly chaff flower	Amaranthaceae	Whole plant	Decoction	expectorant, stomach tonic, laxative, anthelmintic, diuretic, lithotriptic, sudorific, demulcent, anti-inflammatory, anticataract, antifungal, antibacterial, hypoglycemic, antihyperlipidemic, antiperiodic, antiasthmatic, hepatoprotective, anti-allergic properties [31].	alkaloids, tannins, cardiac glycosides, steroids, flavonoids, terpenoids, reducing sugar, and saponin [32].

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Rhaponticum repens (L.) Hidalgo	Russian knapweed	Asteraceae	Whole plant	Decoction	natural antioxidant, antimicrobial, anti-cholinesterase, and anti-amylase agents [33].	oil, with caryophyllene oxide (54.7%), α-copaene (14.8%), and β-caryophyllene (12.1%) [34].
Agave americana L.	American Century Plant	Asparagaceae	Pulp	Solid	antimicrobial activity, and Antioxidant activity [35].	Alkaloids, saponins, tannins, polyphenols, and flavonoids [36].
Ajuga integrifolia Buch.-Ham. ex D.Don	Racted Bugleweed.	Lamiaceae	Whole plant	Decoction	diuretic, stimulant action, aperients, and febrifugal [37].	alkaloids, flavonoids, steroids, triterpenoids, saponins, and tannins like phenolic compounds [37].
Albizia lebbeck (L.) Benth.	Siris	Fabaceae	Whole plant	Decoction, Powder	allergies, asthma, bronchitis, arthritis, fractures, gingivitis, gum inflammation, toothache, hemorrhage, leprosy, leukoderma, malaria, night blindness, scorpion sting, snakebite, and syphilis [38].	alkaloids, glycosides, tannins, saponins, flavonoids, and carbohydrates [38].
Alhagi maurorum Medic.	Camelthorn	Fabaceae	Whole plant	Decoction	purgative, diaphoretic, expectorant, and diuretic are used to treat piles, migraine, warts, and rheumatism [39].	carbohydrates, alkaloids, saponins, tannins, phenolics, and flavonoids [40].

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***Aloe vera* (L.) Burm.f.**	Aloe	Aloaceae	Leaves	Gel/extract	Anti-cancer action, skin and digestive protective activity, and antimicrobial properties [41].	Tannins, Saponins, Alkaloids, Phenols, Terpenoids, Flavonoids [42].
Asphodelus tenuifolius Cav.	Onionweed	Asphodelaceae	Whole plant	Powder	antioxidant, antibacterial, antifungal, antiviral and cytotoxicity [43].	flavonoids, anthraquinones, phenolic acids, triterpenes, fatty acids, and naphthalene derivatives [43].
Azadirachta indica A. Juss.	Neem Tree	Meliaceae	Leaves	Decoction	antioxidant, anti-inflammatory, and anti-apoptotic properties [44].	limonoids, tannins, alkaloids, terpenoids, catechins, sterols, and gallic acid [44].
Capparis decidua (Forssk.) Edgew	Caper	Capparaceae	Fruit, stem	Decoction	antidiabetic, anthelmintic, antibacterial, antifungal, analgesic, anti-nociceptive, antirheumatic, hypolipidemic, antiatherosclerotic, anti-tumor, antigiardial, antioxidant, anti-inflammatory, hepatoprotective, and anticonvulsant activities [45].	alkaloids (capparisinine, capparisine, stachydrine, isocodonocarpine), phenolics, flavonoids, sterols, and fatty acids [46].
Capsicum annuum L.	Red pepper	Solanaceae	Fruit	Solid	antioxidant, antimicrobial, and hypoglycemic activities [47].	capsaicinoids, phenolics and fatty acids, carotenoids, capsaicinoids, phenolics (flavonoids), vitamin C, vitamin E, and fatty acids [48].

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Caralluma tuberculata **(N.E.Br.) Meve & Liede**	Chongan	Asclepiadaceae	Whole plant	Chewed	diabetes, rheumatism, leprosy, peptic ulcer, inflammation, jaundice, dysentery, constipation, stomach pain, and hepatitis B and C [49].	steroids, terpenoids, reducing sugars, tannins, beta cyanin, and amino acids [50].
Chrozophora plicata **(Vahl) A.Juss. ex Spreng.**		Euphorbiaceae	Whole plant	Juice	linoleic acid is the major fatty acid followed by oleic, stearic, and palmitic acids [51].	glycosides, tannins, flavonoids, resins, steroids, proteins, fats & oil, and saponins [51].
Cichorium intybus L.	Chicory	Asteraceae	Whole plant	Powder	anti-fungal, anti-bacterial, analgesic, anti-cancer, and anti-diabetic [52].	inulin, esculin, volatile compounds (monoterpenes and sesquiterpenes), coumarins, flavonoids, and vitamins [53].
Citrullus colocynthis (L.) Schrad.	Bitter apple	Cucurbitaceae	Fruit, flower	Steam/Powder	Antidiabetic, antiinflammatory, abortifacient, analgesic, and antiepileptic [54].	alkaloids, flavonoids, coumarins, steroids, and phenolic acids [55].
Citrus maxima (Burm.) Merr.	Pomelo	Rutaceae	Juice	Fruit	antimicrobial, antitumor, antioxidant, anti-inflammatory, anticancer, antiepileptic, stomach tonic, cardiac stimulant, cytotoxic, hepatoprotective,	vitamin C (ascorbic acid) and phytochemical compounds, such as polyphenols and flavonoids [57].

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					nephroprotective, and anti-diabetic activities [56].	
Cuscuta reflexa Roxb.	The giant dodder	Convolvulaceae	Whole plant	Decoction	antimicrobial and antioxidant activity [58].	alkaloids, flavonoids, carbohydrates, glycosides, phytosterols, fixed oil and fats, proteins, phenolic compounds, tannins, and saponins [58].
Cynodon dactylon (L.) Pers.	Bermuda grass	Poaceae	Whole plant	Decoction	exceptional anti-inflammatory, antioxidant, and lipid-lowering properties, anasarca, cancer, convulsions, cough, cramps, diarrhea, dropsy, dysentery, epilepsy, headache, hemorrhage, hypertension, hysteria, measles, rubella, snakebite, sores, stones, tumors, urogenital disorders, warts and wounds [59].	flavonoids, alkaloids, glycosides, terpenoides, triterpenoids steroids, saponins, tannins, resins, phytosterols, reducing sugars, carbohydrates, proteins, volatile oils, and fixed oils [60].
Solanum lycopersicum L.	Tomato	Solanaceae	Fruit	Powder	treatment for burns, scalds, and sunburn. Root decoction is ingested for relief from tooth pain. Tomatoes are rich in lycopene, a substance with beneficial effects on the heart and prostate. Anticancer, It is also used	phenolics, flavonoids, tannins, alkaloids, and terpenoids [62].

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					for rheumatism and headaches [61].	
Melia azedarach L.	Chinaberry tree	Meliaceae	Leaves, seeds, fruit	Juice	antimicrobial, insecticidal, and nematicidal [63].	total phenol, flavonoids, and catechol pools, and the accumulation of β-sitosterol, myo-inositol, succinic acid, sucrose, d-glucose and derivatives, d-psicofuranose, d-(+)-fructofuranose, and the fatty acids stearic, α-linolenic, linoleic and palmitic acids [64].
Mentha longifolia L.	Horsemint	Lamiaceae	Leaves, flowers	Infusion	antimicrobial, gastrointestinal, and nervous system effects [65].	caffeic acid (58.50 µg/g DW), chlorogenic acid (170.90 µg/g), and epicatechin (224.15 µg/g) [66].
Morus nigra L.	Black mulberry	Moraceae	Fruit	Solid	antinociceptive, anti-inflammatory, antimicrobial, anti-melanogenic, antidiabetic, anti-obesity, anti-hyperlipidemic, and anti-cancer activities. protective effects against various human organs and systems, mainly based on its antioxidant capacity. M. nigra can be used as a promising nutraceutical resource to control and	anthocyanins (mainly cyanidin-3-O-glucoside), black mulberry fruits also contain flavonols and phenolic acids. The leaves are a rich source of flavonols, including quercetin and kaempferol in the glycosylated forms and chlorogenic acid as predominant phenolic acids. Mulberry bark roots and twigs are a source of prenylated flavonoids, predominantly morusin [67].

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					prevent various chronic diseases [67].	
Peganum harmala L.	Syrian rue	Zygophyllaceae	Seed	Powder	antimicrobial activity, and antibacterial activity [68].	alkaloids, flavonoids, saponin, terpenes, sterols, and quinons [69].
Taraxacum officinale F.H. Wigg	Common dandelion	Asteraceae	Root	Decoction	anti-inflammatory, anti-tumor, immunostimulatory, anti-microbial, anti-viral, anti-oxidant, anti-diabetic, geno-protective, Diu-erotic and kidney-protective, hepato-protective, neuro-protective, anti-depressant, lung-protective, pancreas-as-protective, and differentiation-inducing actions [70].	flavonoids, terpenoids, triterpenoids, sesquiterpene lactones, sesquiterpenoid phytoalexin, phenols, free sterols, coumarins, saponins, flavones, steroids, amino acids, alkaloids, cardiac glycosides and anthraquinones [71,72].
Thymus serpyllum L.	Creeping thyme	Lamiacea	Whole plant	Decoction	antiseptic, anthelmintic, diuretic, tonic, carminative, antispasmodic, expectorant, emmenagogue, sedative, tonic, anticholesterolemic, immunostimulant, and analgesic [73].	phenolic acids (such as rosmarinic, salvianolic, and caffeic acids) and flavonoids (mainly glucosides of luteolin, apigenin, and their derivatives [73].

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Ziziphus nummularia (Burm. f.) Wight & Arn	Wild jujube	Rhamnaceae	Fruit	Decoction Solid	anti-inflammatory, antioxidant, antimicrobial, anthelmintic, antidiabetic, anticancer, analgesic, and gastrointestinal activities [74].	flavonoids, saponins, glycosides, tannins, and phenolic compounds [74].
Zygophyllum simplex L.	Hureim or simple-leaved bean caper	Zygophyllaceae	Whole plant	Decoction, powder	antidiarrheal, anti-eczema, anti-inflammatory, antidiabetic, and antispasmodic [75].	isorhamnetin-3-O-glucoside, isorhamnetin-3, 7-diglucoside, isorhamnetin-3-O-(6'-malonyl)glucoside, quercetin-3-O-glucoside, quercetin-3-O-(6''-malonyl) glucoside, vanillic acid, ferulic acid, p-hydroxy benzoic acid, p-hydroxy acetophenone (10), p-hydroxy acetophenone glucoside, androsin, adenine, thymidine, adenosine, stigmast-3,6-dione, and β-sitosterol-3-O-β-D-glucoside [76].
***Prosopis cineraria* (L.) Druce**	Ghaf	Fabaceae	Root	Decoction	asthma, birth/postpartum pains, callouses, conjunctivitis, diabetes, diarrhea, expectorant, fever, flu, lactation, liver infection, malaria, otitis, pains, pediculosis, rheumatism, scabies, skin inflammations, spasm, stomach ache, bladder and pancreas stone removal [77].	Rutin, Gallic acid, Patulitrin, Luteolin [77].

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Ricinus communis L.	Castor Oil Bean	Euphorbiaceae	Leaves	Decoction	analgesic, anti-bacterial, anti-cancer, anti-fungal, anti-diabetic, anti-inflammatory, anti-oxidant, mosquitocidal, anti-nociceptive, and anti-fertility properties [78].	alkaloids, Ricinine (0.55%) and N-Demethylricinine (0.016%) and along with six flavones Kaempferol-3-O-β-D-xylopyranoside, Quercetin-3-O-β-Dxylopyranoside, Kaempferol-3-O-β-D-glucopyranoside, Quercetin-3-O-β-D-glucopyranoside, Quercetin-3-O-βrutinoside and Kaempferol -3-O-β-Rutinoside [78].

Specimens that are also native to Iran.

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Some of these plants are presented in Figure 1.



Figure 1. The photos of some of the effective medicinal plants in blood purification.

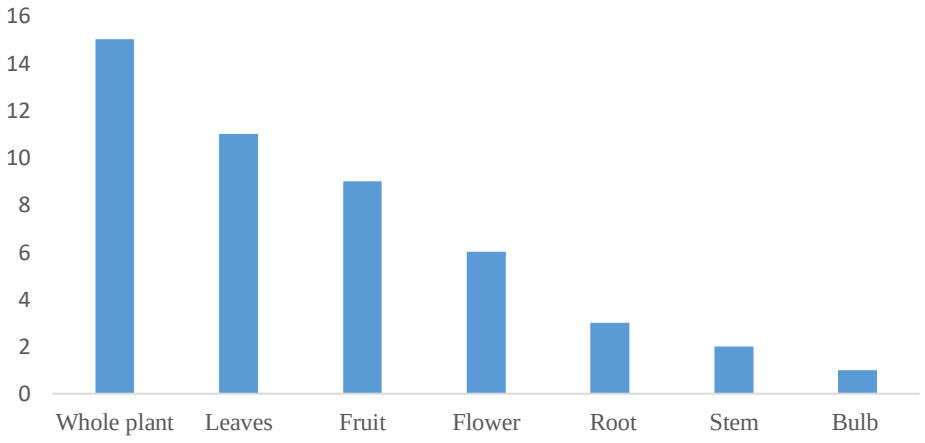


Figure 2. The most used plant organs for blood purification.

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According to Figure 2, the whole of plant, leaves, and fruit were the most used organs.

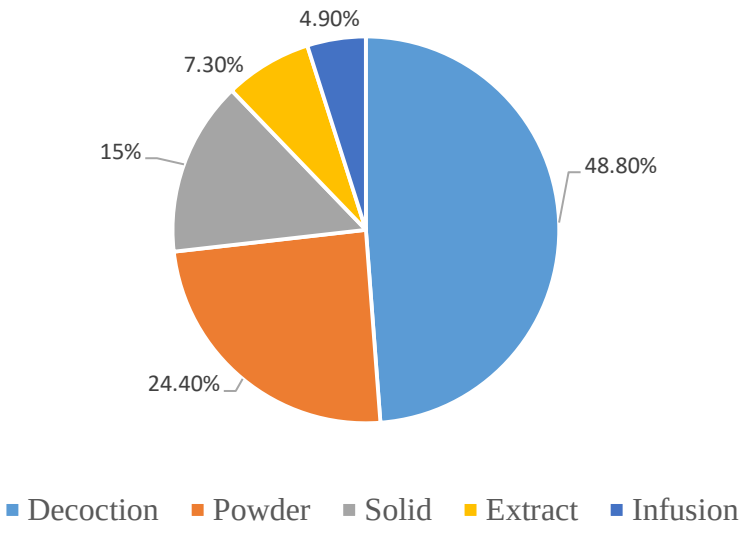


Figure 3. The most common method of consumption for blood purification.

According to Figure 3, decoction and powder were the most consumption method for blood purification. The decoction can be used frequently due to the quick absorption and strongest action compared to other traditional consumption methods [79].

In today's era, with the expansion of knowledge and studies and increasing people's awareness of the dangers caused by chemical preservatives added to food to prevent the corruption of materials in the production industry, the use of harmless and natural preservatives such as extracts of aromatic and medicinal plants and essential oils has become a natural additive due to its antifungal, antiseptic, antibacterial and antioxidant properties, while plants are still considered a rich source of medicinal compounds [80].

Mechanisms of action and side effects of species (Table 1) are discussed below:

Allium sativum L.

Sulfur and antioxidant compounds of the Allium family are one of the most important plant resources used by people (Marrelli et al, 2018). One of the well-known benefits of garlic is its ability to purify and cleanse the blood by relaxing blood vessels and increasing blood flow. This is effective in removing toxins and waste from the body. Garlic can help lower LDL ("bad") cholesterol levels and increase HDL ("good") cholesterol levels, which helps reduce the risk of cardiovascular disease. Also, it has anti-inflammatory properties that can help reduce inflammation in the body [81]. Consuming too much garlic can cause side effects such as lowering blood pressure, indigestion, diarrhea and nausea, stomach problems, and heart palpitations [82, 83].

Punica granatum L.

This plant regulates the cardiovascular system by having anti-inflammatory, and antioxidant properties, reducing the level of bad cholesterol (LDL) in the blood, reducing blood sugar, and regulating blood pressure. Phenolic acid and tannin compounds have antimicrobial effects. Pomegranate has a protective effect on liver cells due to its antioxidant properties and fights against the harmful effects of tetrachlorocarbon. Pomegranate anthocyanin polymers are important in reducing hepatitis C virus replication. In addition to the liver, the anti-toxic and protective effects of pomegranate are also very prominent in the kidneys and are effective in regulating the urinary system. Pomegranate also has potential therapeutic effects in ensuring the health of the bronchi and the respiratory system because it can be easily absorbed from the esophagus wall and affect the bronchi. Due to its astringent properties, this plant prevents blood sputum, which is more evident in sour pomegranate. Thus, this plant is effective in blood purification by improving the function of blood-purifying organs, including the liver and kidney [8, 9]. Eating pomegranate causes the production of gases in the stomach, therefore, consuming large amounts of it causes heaviness in the head and is reported to be harmful to the optic nerves. Sour pomegranate causes coughing and violence in the throat and the inside of the chest. Also, excessive consumption of it causes gastrointestinal

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bleeding, cardiac collapse, and dizziness, and there is a possibility of miscarriage for pregnant women [84].

Senegalia chundra (Roxb. ex Rottler) Maslin

Active compounds such as catechin exert potential therapeutic functions as an antioxidant and anti-inflammatory agent. Also, the presence of terpene compounds has an inhibitory effect on the growth of Candida albicans bacteria and fungi. It is important in the treatment of many liver injuries and blood disorders and is used as a liver protector. All in all, the catechu plant is an excellent blood purifier and skin rejuvenator [12, 13]. Excessive consumption of catechu may cause a severe decrease in blood sugar, abdominal pain, nausea, diarrhea, vomiting, and liver damage, consumption of catechu may be dangerous for pregnant and lactating women; Another problem is the interaction of catechu with some drugs. On the other hand, the use of catechu in high amounts can cause a sharp drop in blood pressure and loss of consciousness of the user [85].

Berberis sp.

The medicinal importance of this plant can be seen from the presence of some chemical compounds such as berberine alkaloids, berberine, and oxyacanthine. This plant has laxative properties and is used as an opener of liver and bile ducts to eliminate toxins and waste materials. This plant, having protective properties of liver, kidney, and bile, and helping to remove waste materials and toxins from the blood, plays an essential role in cleaning and purifying it [14,15,16]. Due to its composition of palmitinium dihydroxide, barberry fruit has an anti-estrogen effect that causes atrophy of the uterus, and this problem causes defects in the nutrition of the fetus and the occurrence of disorders in the formation and development of the nervous system, eyes, hands, spine, and face. It hurts the growth and development of the fetus.

Carthamus tinctorius L.

The compounds include alkaloids, flavonoids, steroids, kinochalkens, and polyacetylenes, among which the compounds of flavonoids and kinochalkens are characteristic of the safflower plant. Flavonoids such as kaempferol have antioxidant properties. Yellow safflower compounds, including hydroxy safflower yellow A, with anti-proliferative and anti-apoptotic activity, reduce liver fibrosis caused by carbon tetra and inhibit pulmonary fibrosis caused by bleomycin, which is very important in improving the function of these organs in blood purification [17,18]. Consuming this plant in high amounts during pregnancy causes eye abnormalities in mouse fetuses [86].

Curcuma longa L.

There are many chemical compounds including curcumin, gingiburn, alpha and beta coumarin, and volatile oil, the most important and effective compound of turmeric is curcumin. Turmeric plays a significant role in regulating blood pressure, reducing bad cholesterol (LDL), and increasing good cholesterol (HDL) in the blood. Hence, by purifying the blood, it reduces cardiovascular diseases [19,20]. Turmeric consumption is not recommended for people with gallstones; because this plant stimulates the secretion and contraction of the gallbladder and causes pain in such people [87].

Indigofera tinctoria L.

The effective and important chemical compounds of the indigo plant are alkaloids, flavonoids, glycosides, tannins phenolic compounds, mineral compounds, etc. It has antioxidant and anti-lipid properties. With extensive therapeutic effects, it helps to reduce and eliminate waste materials and ultimately leads to blood purification [21,22].

Lawsonia inermis L.

This plant has compounds such as flavonoids, tannins, quinones, alkaloids, coumarins, etc. It is also used in regulating the urinary system, including removing waste materials received from the blood, treating skin disorders, stimulating the activity of the immune system, and as an antioxidant. Among its most important properties, it can protect the liver and improve its performance, especially in blood purification [23]. Methanolic extract of the henna plant causes abortion in rats and pigs [88].

Foeniculum vulgare Mill.

Fennel contains compounds such as flavonoids and phenolic acids that exhibit antioxidant activity. These compounds can help neutralize free radicals in the bloodstream, reducing oxidative stress and potentially protecting cells from damage. Fennel has anti-inflammatory properties that may help reduce inflammation in the body. Chronic inflammation can contribute to various health issues, including cardiovascular diseases, so reducing inflammation may support overall blood health. Fennel is known to have mild diuretic properties, which can promote increased urination. This may help in the elimination of toxins and waste products from the bloodstream, contributing to blood

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purification. Fennel can aid digestion and improve gut health. A healthy digestive system helps in the efficient absorption of nutrients and the elimination of waste, which is essential for maintaining clean blood. Fennel may help lower cholesterol levels, which can improve overall cardiovascular health and reduce the risk of blood-related issues. Fennel has been shown to possess antimicrobial properties, which may help in reducing harmful bacteria in the gut and bloodstream, further supporting detoxification processes [24]. This plant induces stimulation of the uterus (harms of fennel for the uterus), intensification of uterine contractions and premature birth, miscarriage, the possibility of tumor formation in cancer patients, headache, fever and chills, nausea, and vomiting [89].

Zingiber officinale Roscoe

Ginger contains several bioactive compounds, such as gingerol and shogaol, which have strong antioxidant properties. These compounds help neutralize free radicals in the bloodstream, reducing oxidative stress and potential damage to cells. Ginger may have mild anticoagulant properties, which can improve blood flow and circulation. This effect can help prevent blood clots and promote a healthier vascular system. Ginger may enhance liver function, which plays a crucial role in detoxifying the blood by metabolizing toxins and waste products for excretion [25].

Urtica dioica L.

Stinging nettle is known for its diuretic effects, which can help increase urine production. This action aids in the elimination of waste products and toxins from the bloodstream, promoting overall detoxification. Stinging nettle is packed with vitamins (like A, C, K) and minerals (such as iron and magnesium), which support overall health. Adequate nutrition is essential for optimal liver and kidney function, both of which play critical roles in blood purification. By promoting kidney health, stinging nettle may enhance the organ's ability to filter blood and remove waste products effectively. Stinging nettle contains various antioxidants that help neutralize free radicals in the bloodstream, reducing oxidative stress and protecting cells from damage. stinging nettle may help lower levels of LDL cholesterol and triglycerides, contributing to better cardiovascular health [26].

Justicia adhatoda L.

Justicia adhatoda contains various phytochemicals, including flavonoids and alkaloids, that exhibit antioxidant activity. These compounds help neutralize free radicals in the bloodstream, reducing oxidative stress and protecting cells from damage. Its high consumption may cause nausea, headache, and vomiting [27].

Abutilon indicum (L.) Sweet.

Abutilon indicum possesses anti-inflammatory properties, which can help reduce inflammation in the blood vessels, promoting better blood flow. Abutilon indicum acts as a diuretic, helping to flush out toxins and excess fluids from the body, and aiding in blood purification. Abutilon indicum can help regulate blood sugar levels, which is crucial for maintaining healthy blood circulation and preventing complications [29,30].

The action mechanisms of other species in Table 1 [14-42], are similar to the above-mentioned. These mechanisms include:

Antioxidant properties:

Antioxidants scavenge free radicals, preventing oxidative stress and cell damage. Medicinal plants with antioxidant properties can reduce inflammation. Phytochemical compounds such as Flavonoids, Polyphenols, Carotenoids, Saponins, Curcumins, Lycopenes, and Vitamin C and E exhibit antioxidant properties.

Anti-inflammatory effects:

Anti-inflammatory compounds in plants reduce inflammation, improving blood flow and overall health. Inflammation damages blood vessels. Medicinal plants help restore vessel function, preventing blood clots and promoting circulation. Chronic inflammation is linked to heart disease, stroke, and cancer. Medicinal plants can help prevent these conditions by reducing inflammation. Phytochemical compounds such as Curcumin, Quercetin, Gingerol, Saponins, Flavonoids, and Lycopenes exhibit Anti-inflammatory properties.

Diuretic activity:

Diuretic plants help the body eliminate excess water and waste products through urine, reducing blood pressure and supporting kidney health. Increased urination helps eliminate toxins and waste products from the bloodstream, contributing to blood purification. Phytochemical compounds such as Caffeic acid and Quercetin exhibit Diuretic activity.

Hepatoprotective effects:

The liver plays a vital role in blood purification, filtering toxins and waste. Enhancing its function can improve

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overall blood quality. Phytochemical compounds such as Curcumin, Berberine, and Flavonoids exhibit Hepatoprotective effects.

Detoxification effects:

Our bodies are constantly exposed to toxins from environmental pollutants, processed foods, and other sources. Some medicinal plants help detoxify the blood by promoting the removal of these harmful materials. Some plants bind to toxins in the gut, preventing their absorption into the bloodstream. Some medicinal plants aid in liver detoxification, enhancing its ability to filter toxins from the blood. Plants with diuretic properties increase urine production, helping to flush out toxins through the kidneys. Phytochemical compounds such as Curcumin and Flavonoids exhibit Detoxification effects.

Immune-Boosting properties:

A strong immune system is crucial for blood purification. Medicinal plants stimulate the production and activity of immune cells, enhancing the body's defense mechanisms. Inflammation weakens the immune system. Medicinal plants reduce inflammation, promoting a healthier immune response. Oxidative stress damages immune cells. Antioxidants in medicinal plants protect immune cells, ensuring their optimal function. Phytochemical compounds such as Flavonoids, Carotenoids, Curcumin, and Gingerol exhibit Immune-Boosting properties.

Blood sugar regulation:

By helping to regulate blood sugar levels, some medicinal plants prevent complications associated with diabetes, which can negatively affect blood health. Phytochemical compounds such as Polyphenols, Glycosides, Saponins, and Flavonoids exhibit Blood sugar regulation

Cholesterol management:

Some medicinal plants help lower levels of LDL cholesterol and triglycerides, contributing to better cardiovascular health and a cleaner bloodstream. Phytochemical compounds such as Flavonoids, Allicin, Saponins, and Curcumin exhibit Cholesterol management.

Antimicrobial properties:

Some medicinal plants help remove harmful bacteria and pathogens in the gut and bloodstream. Phytochemical compounds such as Allicin, Curcumin, Flavonoids, Saponins, and Tannins exhibit Cholesterol management.

Digestive Aid:

Some medicinal plants promote healthy digestion by stimulating saliva and bile production, which can enhance nutrient absorption and waste elimination. A well-functioning digestive system is crucial for maintaining clean blood. Phytochemical compounds such as Gingerol, Curcumin, Fennel oil, Flavonoids, Inulin, and Tannins exhibit Digestive effects.

According to the results, Fabaceae, Asteraceae, and Lamiaceae were the most important families for blood purification. These families include various plants that have been traditionally used for medicinal properties [90, 91, 92]. Many Fabaceae species contain specific phytochemicals such as flavonoids, saponins, and tannins that are known for their detoxifying and blood-purification properties. The historical usage of Fabaceae leads to greater identification and cultivation of these plants for this purpose. The Fabaceae are also a significant source of proteins, vitamins, and minerals [93]. These materials help health improvement and affect blood purification. Another reason for the most use of Fabaceae is the synergistic effects that this family has a synergistic effect with other medicinal plants [94].

The use of medicinal plants for blood purification in South Africa and Pakistan is higher than in other countries. This may reflect a combination of cultural, historical, and socio-economic factors [95, 96]. Both countries have rich traditional medicine practices that have been passed down through generations [96].

Conclusion

Medicinal plants have been used for centuries to treat a wide range of ailments. Their unique property is blood purification which promotes overall health. The important thing in using medicinal plants is to know that excessive use of these plants has many side effects. Therefore, they should be used with caution and under the traditional medicine doctor. Clinical experiments are essential to validate the efficacy and safety of this kind of medicinal plant. Also, Further research is needed to explore the full potential of these plants and develop safe and effective therapies for a range of blood-related conditions for treatments tailored to individual needs.

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Ethics approval:

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

Consent to participate:

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

Author contributions:

SA: Conceptualization, the original draft writing, investigation, writing including reviewing and editing and investigation and formal analysis; ZS: Conceptualization, supervision, and project administration; SA and KP Conceptualization, the original draft writing, investigation, writing including reviewing and editing

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