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A Review of Important Medicinal Plants for Urinary Tract Infection (UTI) treatment and their Mechanisms of Action

Mohammad Sadri[1] , **Pouya Parsaei** [2]✉

[1]Department of Urology, School of Medicine, Urmia University of Medical Sciences, Urmia, Iran
[2]Department of Food Hygiene, Shahrekord Branch, Islamic Azad University, Shahrekord, Iran. Email: pouyaparsaei@yahoo.com

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✉ ***Correspondence to:***
Pouya Parsaei

Email:
pouyaparsaei@yahoo.com

A B S T R A C T

Objective: Infectious diseases represent a prevalent condition within the urinary tract, particularly affecting women. These diseases arise when harmful microorganisms invade the urinary tract and bladder. The etiology of infectious diseases is often attributed to bacteria. This review aims to identify medicinal plants traditionally employed in Iranian medicine for the management of urinary tract infections.

Methodology: This systematic review employed a comprehensive search strategy to identify relevant literature on the use of medicinal plants for urinary tract infections in Iranian traditional medicine. Authoritative scientific databases, including Google Scholar, SID, MagIran, PubMed, and Scopus, were systematically searched using the following keywords: 'medicinal plants,' 'urinary tract infection,' 'Iran.' The search results were filtered to include only ethnobotanical studies relevant to the research question.

Results: A diverse array of medicinal plants have been traditionally employed for the treatment of urinary tract infections in Iranian medicine. Notable examples include *Crocus sativus* (saffron), *Rubus fruticosus* (blackberry), *Vaccinium myrtillus* (blueberry), *Mentha spicata* (mint), *Corylus avellana* (hazelnut), *Borago officinalis* (borage), *Carduus nutans* (thistle), *Citrus limon* (lemon), *Origanum vulgare* (oregano), *Althea officinalis* (marshmallow), *Thymus vulgaris* (thyme), *Foeniculum vulgare* (fennel), *Achillea millefolium* (yarrow), *Matricaria recutita* (chamomile), and *Urtica dioica* (nettle).

Conclusion: Research has demonstrated that certain medicinal plants and spices possess antimicrobial and antibiotic properties that may contribute to the treatment of urinary tract infections.

Key words: Disease, Kidney, Bladder, Urinary tract infection, Medicinal plants, Iran

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Introduction

The urinary system is anatomically designed to serve as a barrier against the entry of harmful microorganisms. However, in certain circumstances, bacteria can breach these defenses, ascend the urethra, and colonize the bladder [1]. Several factors may predispose individuals to urinary tract infections (UTIs), a common health condition affecting both men and women [2, 3]. UTIs can involve any part of the urinary tract, including the kidneys, ureters, bladder, and urethra [3]. However, the majority of infections occur in the lower urinary tract, specifically the bladder and urethra. Epidemiological data indicate that women are approximately 50% more likely to experience UTIs compared to men [4].

The clinical manifestations of urinary tract infections (UTIs) can vary depending on age, gender, and the specific anatomical location of the infection. In some cases, individuals may remain asymptomatic for several days before experiencing symptoms. Common symptoms in adults include dysuria, urinary frequency with small volumes, nocturia, hematuria, cloudy urine, and changes in urine color [5]. The most prevalent microbial agents responsible for UTIs include *Escherichia coli*, *Proteus mirabilis*, *Enterococcus faecalis*, *Staphylococcus saprophyticus*, and *Klebsiella pneumoniae*. The diagnosis of UTIs is primarily based on a combination of clinical symptoms and urinalysis [6]. Antibiotic therapy is the first-line treatment for UTIs, with commonly used medications including Trimethoprim/Sulfamethoxazole, Fosfomycin, Nitrofurantoin, Cephalexin, and Ceftriaxone [7].

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Due to the potential risks associated with certain antibiotics, such as Fluoroquinolones, their use is generally discouraged for uncomplicated urinary tract infections (UTIs) [8]. The potential side effects of chemical drugs have prompted increased interest in natural and herbal remedies, which often exhibit greater safety profiles and fewer adverse effects [9]. Traditional medicine offers a valuable approach to the management of UTIs, leveraging the antibacterial and diuretic properties of specific medicinal plants. These plants can contribute to enhancing the immune system and preventing bacterial adherence to the urinary tract [10]. In addition to herbal remedies, traditional medicine emphasizes the importance of adequate fluid intake, a balanced diet, and lifestyle modifications as preventive and therapeutic measures for UTIs, without the risk of associated side effects [11].

This review aims to comprehensively investigate the microbial factors and common treatment methods associated with urinary tract infections, with a particular emphasis on the role of traditional Iranian medicine and herbal remedies. Given the high prevalence of urinary tract infections and the potential adverse effects of chemical drugs, exploring natural and safer alternatives can contribute significantly to improving public health and mitigating antimicrobial resistance.

Material and methods:

This systematic review employed a comprehensive search strategy to identify relevant literature on the use of herbal medicines for urinary tract infections in Iran. Authoritative scientific databases, including Google Scholar, SID, MagIran, PubMed, and Scopus, were systematically searched using the following keywords: 'herbal medicines,' 'urinary tract infection,' 'bladder infection,' and 'Iran.'

A broad initial search was conducted to capture all potentially relevant articles. The search terms were combined, and the results were limited to articles published in Persian or English. Studies that investigated the effects of medicinal plants on urinary tract infections and bladder health within Iran were selected for inclusion in this systematic review.

The inclusion criteria for selected articles were as follows: (1) published in full text; (2) focused on the effects of medicinal plants on urinary tract infections; and (3) conducted within Iran. Articles were excluded if they were published as abstracts only, investigated medicinal plants in other countries, or focused on infections other than urinary tract infections.

Results:

This review identified a range of medicinal plants traditionally employed for the management of urinary tract infections in Iranian medicine. Notable examples include *Crocus sativus* (saffron), *Rubus fruticosus* (raspberry), *Vaccinium myrtillus* (blueberry), *Mentha spicata* (peppermint), *Corylus avellana* (hazelnut), *Borago officinalis* (borage), *Silybum marianum* (milk thistle), *Citrus limon* (lemon), *Origanum vulgare* (oregano), *Althea officinalis* (marshmallow), *Thymus vulgaris* (thyme), *Foeniculum vulgare* (fennel), *Achillea millefolium* (yarrow), *Matricaria recutita* (chamomile), and *Urtica dioica* (nettle). Additional information regarding these medicinal plants and their potential applications for urinary tract infections is provided in Table 1.

Table 1. Medicinal plants that are effective in treating urinary tract infections.

English Name	Scientific name	Family	Active ingredients	Mechanism of action [13-22]
Saffron	*Crocus sativus*	Iridaceae	Crocin, Safranal	Anti-inflammatory, Anti-microbial
Raspberry	*Rubus idaeus*	Rosaceae	Tannins, Anthocyanins	Anti-inflammatory, Anti-bacterial
Peppermint	*Mentha piperita*	Lamiaceae	menthol	Anti-inflammatory, Anti-bacterial
Hazelnut	*Corylus avellana*	Betulaceae	Flavonoids, tannins	Anti-inflammatory, Anti-microbial

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Borage	*Borago officinalis*	Boraginaceae	Gamma-Linolenic Acid (GLA)	Anti-inflammatory, Anti-microbial
Milk Thistle	*Silybum marianum*	Asteraceae	Silymarin	Hepathoprotective, Anti-inflammatory
Lemon	*Citrus limon*	Rutaceae	Vitamin C, flavonoids	Anti-oxidant, Anti-microbial
Oregano	*Origanum vulgare*	Lamiaceae	Carvacrol, thymol	Anti-microbial, Anti-inflammatory
Marshmallow	*Althaea officinalis*	Malvaceae	Mucilage, flavonoids	Mucosal protector, Anti-inflammatory,
Thyme	*Thymus vulgaris*	Lamiaceae	Carvacrol, thymol	Anti-microbial, Anti-inflammatory
Fennel	*Foeniculum vulgare*	Apiaceae	anethole	Anti-microbial, antispasmodic
Yarrow	*Achillea millefolium*	Asteraceae	Flavonoids, sesquiterpene lactones	Anti-microbial, Anti-inflammatory
Chamomile	Asteraceae	*Matricaria chamomilla*	Apigenin, camazulene	Anti-microbial, Anti-inflammatory
Nettle	*Urtica dioica*	Urticaceae	phenolic acids, tannins	Anti-microbial, Anti-inflammatory

An analysis of Table 1 reveals that the medicinal plants effective in treating urinary tract infections belong to a diverse range of plant families, including Iridaceae, Malvaceae, Apiaceae, Urticaceae, Rosaceae, Lamiaceae, Betulaceae, Boraginaceae, and Asteraceae. Notably, the Lamiaceae family is well-represented in the table, with plants such as peppermint, pennyroyal, and thyme. This suggests that the active compounds found in Lamiaceae plants may play a significant role in combating urinary tract infections. The Asteraceae family also features prominently, with plants like milk thistle, yarrow, and chamomile. These two plant families are particularly noteworthy for their potential therapeutic applications in infectious diseases, owing to their diverse bioactive compounds and potent antimicrobial properties.

The medicinal plants listed in Table 1 contain a diverse array of bioactive compounds, including antioxidants, flavonoids, tannins, anthocyanins, vitamins, and specific compounds such as crocin, safranal, menthol, carvacrol, and thymol. Among these compounds, flavonoids and tannins are particularly noteworthy for their anti-inflammatory and antimicrobial properties. Flavonoids are well-known for their antioxidant and anti-inflammatory effects, while tannins exhibit potent antimicrobial activity, making them particularly beneficial for the treatment of urinary tract infections.

Active components such as carvacrol and thymol, found in plants like oregano and thyme, possess strong antibacterial and anti-inflammatory properties, playing a crucial role in inhibiting bacterial growth within the urinary tract. A significant proportion of the herbal plants listed in Table 1 exhibit anti-inflammatory and antimicrobial properties, which are recognized as key mechanisms for treating urinary tract infections. Medicinal plants such as saffron, thyme, oregano, and milk thistle, containing bioactive compounds like carvacrol, thymol, and silymarin, have the potential to inhibit infection and reduce inflammation within the urinary system.

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Discussion

Traditional Iranian medicine has a long history of employing medicinal plants to address urinary tract infections and related conditions. These plants possess anti-inflammatory and antimicrobial properties that have been scientifically validated for their effectiveness in treating these infections. The findings presented in Table 1 demonstrate the alignment of traditional knowledge with contemporary research, particularly within the field of phytomedicine, which has gained significant attention in recent years. Medicinal plants have historically played a pivotal role in the treatment of various diseases, including urinary tract infections. These plants have been shown to exhibit anti-inflammatory, antimicrobial, and protective effects, attributed to the presence of diverse bioactive compounds.

Saffron (*Crocus sativus*) contains two bioactive compounds, crocin and safranal, known for their anti-inflammatory and antimicrobial properties. These compounds may contribute to reducing inflammation and inhibiting microbial growth associated with urinary tract infections (UTIs) [23]. Raspberry (*Rubus idaeus*) is characterized by its content of tannins and anthocyanins, which possess anti-inflammatory and antibacterial properties, potentially alleviating UTI symptoms [24]. The primary component of peppermint (*Mentha piperita*) is menthol, a compound with potent antibacterial and anti-inflammatory effects. By reducing inflammation and preventing bacterial growth, menthol may play a significant role in the treatment of UTIs [25]. Hazelnuts (*Corylus avellana*) contain flavonoids and tannins, which exhibit antioxidant and antimicrobial properties. These compounds may contribute to preventing UTIs by inhibiting free radicals and reducing inflammation [26].

Borage (*Borago officinalis*) contains gamma-linolenic acid, a compound with anti-inflammatory and antimicrobial properties. The sedative effects of borage may contribute to alleviating inflammation associated with urinary tract infections (UTIs) [27]. Silymarin, the primary bioactive compound in milk thistle (*Silybum marianum*), is known for its hepatoprotective and anti-inflammatory properties. The antioxidant effects of silymarin may enhance immune function and contribute to the elimination of infections [28]. Lemon (*Citrus limon*) is rich in vitamin C and flavonoids, which exhibit antioxidant and anti-inflammatory properties. These compounds may prevent and treat UTIs by boosting the immune system and reducing inflammation [29].

Oregano (*Origanum vulgare*) contains carvacrol and thymol, potent antimicrobial compounds that can effectively inhibit microbial growth and reduce inflammation within the urinary tract [30]. Marshmallow (*Althea officinalis*) contains mucilage and flavonoids, which possess anti-inflammatory and mucosal protective properties. These compounds may alleviate UTIs by soothing and protecting the irritated mucosal membranes of the urinary tract [31]. Thyme (*Thymus vulgaris*) is characterized by the presence of thymol and carvacrol, which exhibit potent antimicrobial and anti-inflammatory properties. These compounds may contribute to inhibiting bacterial proliferation and alleviating inflammation in the urinary tract [32]. Fennel (*Foeniculum vulgare*) contains anethole, a compound with antimicrobial and antispasmodic properties that may help alleviate pain and symptoms associated with UTIs [33]. Yarrow (*Achillea millefolium*) is a source of flavonoids and sesquiterpene lactones (SLs), which exhibit anti-inflammatory and antimicrobial effects and may be beneficial for the treatment of UTIs [34].

Chamomile (*Matricaria recutita*) contains apigenin and chamazulene, compounds known for their anti-inflammatory and antimicrobial properties. These bioactive compounds may contribute to the treatment of urinary tract infections (UTIs) by reducing inflammation and inhibiting bacterial growth [35]. Nettles (*Urtica dioica*) are characterized by the presence of tannins and phenolic acids, which exhibit anti-inflammatory and antimicrobial properties and may be effective in preventing and treating UTIs [36]. These medicinal plants, with their diverse bioactive compounds, can play a significant role in improving and preventing urinary tract infections through various mechanisms, including inhibiting microbial growth, reducing inflammation, and enhancing the immune system. The use of these plants as a complementary therapy alongside conventional medical treatments may contribute to reducing symptoms and accelerating patient recovery.

Conclusion

The medicinal plants identified in this review exhibit a diverse range of pharmacological properties, including anti-inflammatory, antibacterial, antioxidant, relaxant, and hepatoprotective effects. This suggests that these plants hold significant potential for future research into the treatment of not only urinary tract infections but also other infectious and chronic diseases. Bioactive compounds such as flavonoids, thymol, and carvacrol warrant further investigation as potential therapeutic agents with multiple mechanisms of action, paving the way for the development of novel herbal drugs with broader applications. The medicinal plants effective in treating urinary tract infections demonstrate a rich and diverse composition, encompassing anti-inflammatory, antimicrobial, and antioxidant mechanisms. These mechanisms are not only relevant for urinary tract infections but may also be applicable to other inflammatory and infectious conditions. Given the historical use of these plants in traditional Iranian medicine, further research could lead to the development of innovative herbal-based therapeutic products.

Statements and Declarations

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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

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

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References

1. Nyland TG, Mattoon JS, Herrgesell EJ, Wisner ER. Urinary tract. Small animal diagnostic ultrasound. 2002;93:127.
2. Foxman B. The epidemiology of urinary tract infection. Nature Reviews Urology. 2010 Dec;7(12):653-60.
3. Barnett BJ, Stephens DS. Urinary tract infection: an overview. The American journal of the medical sciences. 1997 Oct 1;314(4):245-9.
4. Byron JK. Urinary tract infection. Veterinary Clinics: Small Animal Practice. 2019 Mar 1;49(2):211-21.
5. O'sullivan DJ, Fitzgerald MG, Meynell MJ, Malins JM. Urinary tract infection. British medical journal. 1961 Mar 3;1(5228):786.
6. Stamm WE, Hooton TM. Management of urinary tract infections in adults. New England journal of medicine. 1993 Oct 28;329(18):1328-34.
7. Holm A, Cordoba G, Aabenhus R. Prescription of antibiotics for urinary tract infection in general practice in Denmark. Scandinavian journal of primary health care. 2019 Jan 2;37(1):83-9.
8. Peterson GM, Stanton LA, Bergin JK, Chapman GA. Improving the prescribing of antibiotics for urinary tract infection. Journal of clinical pharmacy and therapeutics. 1997 Apr;22(2):147-53.
9. Shahzamani S, Hosseini SF, Karimi M, Khajoei Nejad F, Ghobadi R, Mazaheri Y, Parsaei, P. Anticancer potential of Rhus coriaria L.(Sumac): A mini review. *Caspian Journal of Environmental Sciences* 2023; 1-5.
10. Shaheen G, Akram M, Jabeen F, Ali Shah SM, Munir N, Daniyal M, Riaz M, Tahir IM, Ghauri AO, Sultana S, Zainab R. Therapeutic potential of medicinal plants for the management of urinary tract infection: A systematic review. Clinical and Experimental Pharmacology and Physiology. 2019 Jul;46(7):613-24.
11. Bag A, Bhattacharyya S, Chattopadhyay R. Medicinal plants and urinary tract infections: An update. Pharmacognosy Reviews. 2008 Jul 1;2(4):277.
12. Sharma A, Chandraker S, Patel VK, Ramteke P. Antibacterial activity of medicinal plants against pathogens causing complicated urinary tract infections. Indian journal of pharmaceutical sciences. 2009 Mar;71(2):136.
13. Zargari A. Medicinal Plants. 6th ed. Tehran: Tehran University Press; 1990.
14. Amin GH. Popular Medicinal Plants of Iran. Tehran: Iranian Research Institute of Medicinal Plants; 1991.
15. Mozaffarian V. A Dictionary of Iranian Plant Names. Tehran: Farhang Moaser Publishers; 1996.
16. Mir Heidar H. Herbal Treatment in Iranian Traditional Medicine. Vol 1. 2nd ed. Tehran: Islamic Culture Press; 1993.
17. Rechinger KH. Flora Iranica. Graz: Akademische Druck- und Verlagsanstalt; 1963-2010.
18. Nadkarni KM. Indian Materia Medica. 3rd ed. Bombay: Popular Prakashan; 1976.
19. Naseri M, Zargaran A, Larijani B, Hamidizadeh N. Role of Traditional Iranian Medicine in the Treatment of Diabetes Mellitus. Int J Diabetes Dev Ctries. 2015;35(2):149-153.
20. Avicenna. The Canon of Medicine (Al-Qanun fi al-Tibb). New York: AMS Press; 1999.
21. Aghili Khorasani Shirazi MH. Makhzan al-Advieh. Tehran: Tehran University of Medical Sciences Press; 2008.
22. Qarshi M. Zakhireye Kharazmshahi (The Treasure of Kharazmshah). Tehran: Research Institute for Islamic and Complementary Medicine; 2001
23. Abdel-Shafi S, Al-Mohammadi AR, Hamdi S, Moustafa AH, Enan G. Biological characterization and inhibition of Streptococcus pyogenes ZUH1 causing chronic cystitis by crocus sativus methanol extract, bee honey alone or in combination with antibiotics: An in vitro study. Molecules. 2019 Aug 9;24(16):2903.
24. Hałasa R, Mizerska U, Kula M, Krauze-Baranowska M. Screening Tests for the Interaction of Rubus idaeus and Rubus occidentalis Extracts with Antibiotics against Gram-Positive and Gram-Negative Human Pathogens. Antibiotics. 2024 Jul 15;13(7):653.
25. Acharjee M, Zerin N, Ishma T, Mahmud MR. In-vitro anti-bacterial activity of medicinal plants against Urinary Tract Infection (UTI) causing bacteria along with their

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[DOI: 10.61186/pbp.7.1.12]

synergistic effects with commercially available antibiotics. New Microbes and New Infections. 2023 Jan 1;51:101076.
26. Zhao J, Wang X, Lin H, Lin Z. Hazelnut and its by-products: A comprehensive review of nutrition, phytochemical profile, extraction, bioactivities and applications. Food Chemistry. 2023 Jul 1;413:135576.
27. Al-Qurashi FM, Kadhum ZI. Antibacterial Effect of some Herbal plants against Pathogenic Bacteria Isolated from Patients with Urinary Tract Infections (UTI). AL-yarmouk Journall. 2019;11(1):36-47.
28. Yarnell E. Botanical medicines for the urinary tract. World journal of urology. 2002 Nov;20:285-93.
29. Sharma N, Rathore DS. Antibacterial effects of Citrus limon peel extract on human pathogenic bacteria with special reference to Urinary Tract Infection. Int. J. Sci. Res. in Biological Sciences Vol. 2018 Apr;5(2).
30. Sánchez García E, Torres-Alvarez C, Morales Sosa EG, Pimentel-González M, Villarreal Treviño L, Amaya Guerra CA, Castillo S, Rodríguez Rodríguez J. Essential Oil of Fractionated Oregano as Motility Inhibitor of Bacteria Associated with Urinary Tract Infections. Antibiotics. 2024 Jul 18;13(7):665.
31. Kaabi SA, Ali BM. Pharmacology of Herbal Remedies for Urinary Tract Infection in Western Countries: doi. org/10.26538/tjnpr/v4i10. 1. Tropical Journal of Natural Product Research (TJNPR). 2020 Oct 1;4(10):653-60.
32. Mousa AA, Elbeltagy A, Fahim S, Elmasri A. PROMOTING ACTION OF ANTIBIOTICS USING THYME OIL FORMS AGAINST RESISTANT BACTERIA CAUSING URINARY TRACT INFECTION. Menoufia Journal of Agricultural Biotechnology. 2024 Mar 31;9(3):53-71.
33. Abdullah BH, Abbas IS, Jasiem TM. Phytochemical study and evaluation of Iraqi fennel seed oil as antibacterial of urinary tract infection. Indian Journal of Forensic Medicine & Toxicology. 2020 Apr 29;14(2):842-6.
34. Komala M, Kumar KS. Urinary tract infection: causes, symptoms, diagnosis and it's management. Indian Journal of Research in Pharmacy and Biotechnology. 2013 Mar 1;1(2):226.
35. Jafarzadeh MM, Moghaddam MJ, Bakhshi D. Antimicrobial activity of three plant species against multi-drug resistant E. coli causing urinary tract infection. Journal of Herbal Medicine. 2020 Aug 1;22:100352.
36. Al-Sorchee SM, Zaain LA, Saqii AH. The effect of nettle leaves and corn silk extracts on the isolated bacteria from children UTI. Tikrit Journal for Agricultural Sciences. 2016;16(2).

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