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HERBAL REMEDIES FOR URINARY TRACT INFECTION

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ABSTRACT

A urinary tract infections (UTIs) are characterized by a strong and sudden urge to urinate, followed by a slow and painful release of very little urine. Antibiotics are used for the treatment of all UTIs. However, the use of antibiotics can have side effects and if not checked in time can lead to further complications. Moreover, the emergence of antibiotic resistant bacterial strains is of major concern for physicians. During last decade the prevalence of multidrug-resistant bacteria has dramatically increased worldwide due to misuse of antibiotics. As an alternative medicine, there are quite a few herbal remedies that prove very effective in preventing and treating UTIs. The present review focuses on the herbal remedies for the treatment of UTIs.

Key words: Urinary tract infections (UTIs), Cranberry, Uva ursi, Coriander, Amla,

INTRODUCTION

The parts of plants (bark, leaves, flower, seed, and fruit) are important in human diet. In addition to boosting flavour, herbs and spices are also known for their preservative and medicinal value (DeSouza, 2005). Because of the concern about the side effects of antibiotics, the use of plants as an alternative in healing and treatment of various diseases has been on the rise in the last few decades **(**Ansari *et al.,* 2006**).** In recent years, modern science has started paying attention to the properties of different parts of plants. The choice of herbs, through their herbal actions, along with appropriate therapeutic dosing strategies, will determine the effectiveness of herbal treatment and prevent the need to intervene with antibiotics (Dipasquale, 2008). Urinary tract infections (UTIs) can also be effectively treated with herbal medicine. There are several plants that help to treat UTIs. Some of these are discussed below.

1. Cranberry (*Vaccinium* o*xycoccos*)

Cranberry has been used for the treatment of urinary tract ailments for long. The use of encapsulated cranberry extracts, cranberry juice and cranberry tincture (cranberry extracted into alcohol) are recommended for the treatment of UTIs. Raw cranberries and cranberry juice are abundant food sources of the anthocyanidin flavonoids, cyanidin, peonidin and quercetin (Zheng and Wang, 2003; Duthie *et al.,* 2006). Cranberries also contain proanthocyanidins which demonstrate ability to prevent *E. coli*, the most common cause of bacterial UTIs, from adhering to the inner walls of bladder (Gibson *et al.,* 1991; Haverkorn and Mandigers, 1994; Griffiths, 2003; Lynch, 2004**).** However, the literature about the effects of cranberry on other urinary pathogens is lacking in the literature. It is suggested that the daily consumption of concentrated cranberry juice can significantly prevent the recurrence of symptomatic UTIs in children (Ferrara *et al.,* 2009). Besides, the constituents of cranberry juice also show efficacy against formation of kidney stones (Kessler *et al.,* 2002; McHarg *et al.,* 2003).

2. Blueberry (*Vaccinium corymbosum*)

Blueberry has also been used to treat and prevent UTIs. There is some evidence from four good quality randomized controlled trials that cranberry juice may decrease the number of symptomatic UTIs over a 12-month period, particularly in women with recurrent UTIs (Jepson and Craig, 2007). Like Cranberry, blueberries also demonstrate bioactive compounds that inhibit the ability of *E. coli* to adhere to the walls of the bladder. This enables the bladder to "flush out" the bacteria when urine is expelled. These substances include tannin-like compounds that are called proanthocyanidins. The literature about the effects of cranberry on other urinary pathogens is lacking.

3. Uva ursi (*Arctostaphylos uva-ursi*)

Uva ursi or bearberry has long been a part of North American and European herbal traditions as a remedy for UTIs (Flynn and Roest, 1995). This herb is approved in Germany for treatment of cystitis (Blumenthal *et al.,* 1998). Its leaves contain a glycoside arbutin, which exhibits an antibacterial effect and act as mild diuretic. An effusion of bearberry leaves is the recommended method of use, which may be made by soaking the leaves in ethanol and then diluting with water. It has been used for urinary tract complaints, including cystitis and urolithiasis (Kemper, 1999; Schindler *et al*., 2002; Quintus *et al.,* 2005). Uva ursi leaves also contain a glycoside known as arbutoside, which forms glucose and hydroquinone in the gut. Following absorption, hydroquinone reaches the liver and becomes

glucuronidated. After renal excretion, the glucuronide portion falls away, provided that the urinary pH rises above seven, thereby allowing hydroquinone to act directly against urinary pathogens. However, chronic administration of uva ursi may invite problems, since long-term exposure to synthetic hydroquinones is carcinogenic (Yarnell, 2002).

4. Horseradish (*Armoracia rusticana*)

Horseradish is known to have diuretic properties. Its roots have been used to treat various health problems including urinary tract infections, bronchitis, sinus congestion, ingrowing toenails and coughs. It is rich in vitamin C. It is also a stimulant, diuretic, diaphoretic, rubefacient and antiseptic (Goos *et al.,* 2006). Several early *in vitro* studies found that some horseradish constituents may have antibacterial activity (Halbeisen, 1957; Wechselberg, 1958). Horseradish volatile oil also exhibits an antibacterial effect on the bacteria that can cause UTIs (Kienholz, 1960).

5. Goldenseal (*Hydrastis Canadensis*)

Goldenseal is reputed to help treat many types of infections. It contains the isoquinoline alkaloids: hydrastine, berberine, berberastine, hydrastinine, tetrahydroberberastine, canadine, and canalidine (Weber *et al.,* 2003). Multiple bacteria and fungi, along with selected protozoa and chlamydia are susceptible to berberine *in vitro* (Simon and Kerry, 2000). Berberine prevents UTIs by inhibiting bacteria from adhering to the wall of the urinary bladder (Sun *et al.,* 1988). Therefore, goldenseal and other plants containing berberine may help in the treatment of UTIs. These herbs have not, however, been studied for the treatment of UTIs in humans. Because of the anti-inflammatory effects of plantain, it may be beneficial in some people with UTIs. However, human trials have not been done to confirm this possibility or to confirm the traditional belief that plantain is diuretic (Aune *et al.,* 1998). In a plainlain study, the volatile oil of horseradish has also been shown to kill bacteria that can cause urinary tract infections (Kienhold and Kemkes, 1961). Further studies are necessary to confirm the safety and effectiveness of horseradish in treating urinary tract infections.

6. Yarrow (*Achillea millefolium*)

Yarrow has seen historical use as a medicine because of its astringent effects. It contains isovaleric acid, salicylic acid, asparagin, sterols, flavonoids, bitters, tannins, and coumarins (Hutchens, 1973). It is a urinary disinfectant with a powerful antibacterial action and astringent effect that helps tone weak bladder tissues. It is also recommended for women with incontinence (Weed, 1992). The aerial parts of this plant are used for phlegm conditions, as a bitter digestive tonic to encourage bile flow, and as a diuretic (Achillea, 2003). It is also reported to be associated with the treatment of the Amenorrhea, anti-inflammatory, bowels, bleeding, blood clots, blood pressure (lowers), blood purifier, blood vessels (tones), catarrh (acute, repertory), colds, chicken pox, circulation, contraceptive (unproven), cystitis, diabetes treatment, digestion (stimulates), dyspepsia, eczema, fevers, flu's, gastritis, glandular system, gum ailments, heartbeat (slow), influenza, insect repellant, internal bleeding, liver (stimulates and regulates), lungs (hemorrhage), measles, menses (suppressed), menorrhagia, menstruation (regulates, relieves pain), nipples (soreness), nosebleeds, piles (bleeding), smallpox, stomach sickness, toothache, thrombosis, ulcers, urinary antiseptic, uterus (tighten and contract), varicose veins, and vision (Kowalchik and Hylton, 2010).

7. *Echinacea* (*Echinacea purpurea*)

Echinacea is one of the most popular herbs in America. Several laboratory and animal studies suggest that *echinacea* contains active substances that enhance the activity of the immune system, relieve pain, reduce inflammation, and have hormonal, antiviral, and antioxidant effects (Borchers *et al.,* 2000). Echinacea has also been shown to clear UTIs. Its extract has a cortisone-like activity which inhibits hyaluronidase enzyme that is associated with inflammation and swelling. It has antibacterial properties against *Staphylococcus aureus, Corynebacterium diphtheriae* and *Proteus vulgaris* (Anonymous, 2000). Reported adverse effects of echinacea are primarily allergic in nature and also include anaphylaxis, asthma attacks, thrombocytopenic purpura, leucopenia, abdominal pain, nausea, dysuria, arthralgia, myalgia, and dizziness (Huntley *et al,* 2005). In contrast, a controlled double-blind study from the University of Virginia School of Medicine and documented in the New England Journal of Medicine stated that echinacea extracts had "no clinically significant effects" on rates of infection or duration or intensity of symptoms. The effects held when the herb was taken immediately following infectious viral exposure and when taken as a prophylaxis starting a week prior to exposure (Ronald *et al.,* 2005).

8. Dandelion (*Taraxacum officinale*)

Dandelion is a valuable herb with many culinary and medicinal uses. Dandelion is a rich source of vitamins A, B complex, C, and D, as well as minerals such as iron, potassium, calcium and zinc. The other active constituents of

Dandelion include taraxacin, taraxacoside, inulin, phenolic acids, sesquiterpene lactones, triterpenes, coumarins, catortenoids and minerals. It is a natural diuretic that increases urine production by promoting the excretion of salts and water from the kidney. Dandelion may be used for a wide range of conditions requiring mild diuretic treatment, such as poor digestion, liver disorders, and high blood pressure. Furthermore, it relieves false sensations of urgency and also restores normal liver function (Myhre, 2000). It is a source of potassium, a nutrient often lost through the use of other natural and synthetic diuretics (Blumenthal *et al.*, 2002).

9. Buchu (*Barosma betulina*)

Buchu is used in Western herbal medicine for the treatment of urinary complaints since 12th century. It is used as a diuretic and a urinary disinfectant. It also stimulates urination and soothes burning sensation during urination. Taken regularly, buchu can help to prevent recurrent attacks of chronic cystitis or urethritis. In addition, buchu is also taken for prostatitis and irritable bladder. However, it is not recommended when there is acute inflammation in the urinary tract (Myhre, 2000). However, the German Commission E monograph on buchu concludes that insufficient evidence supports the modern use of buchu for the treatment of UTIs or inflammation (Blumenthal *et al.*, 1998). Essential oil components diosmin and pulegone can cause gastrointestinal and renal irritation. Pulegone is known to be an abortifacient and to increase menstrual flow; therefore, use is not recommended during pregnancy. No scientific evidence is available to justify buchu's herbal uses, but its diuretic and anti-inflammatory effects may be attributed to the volatile oil and flavonoid's irritant nature. Despite the lack of evidence, buchu is still used today in western herbal medicine for urinary tract ailments, cystitis or urethritis prophylaxis and prostatitis. It is also used in combination with other herbs such as cornsilk, juniper and uva-ursi (Bisset, 1994).

10. Cleavers (*Galium aparine)*

Cleavers is an edible and medicinal herb. It has been used for centuries as an alternative medicine by peoples in many continents. This plant was traditionally used to treat skin diseases. It has a diuretic action, aiding elimination of wastes, and also acts to enhance the lymphatic system, promoting lymphatic drainage of toxins and wastes so that they can be excreted via the urinary system. It is also used to lower the blood pressure and body temperature, as well as for cystitis (Anomymous, 2009) Cleavers are used as a soothing diuretic, and as such, the herb promotes an increased urine flow, which helps to rid the kidneys and bladder of gravel and stones, clear the urinary tract of various infections (such as cystitis), alleviate prostate disorders, and treat other acute and inflammatory urinary diseases such as acute and chronic cystitis (Myhre, 2000). As, it is the most valuable refrigerant and diuretic, and found very beneficial in many diseases of the urinary organs, as suppression of urine, calculous affections, inflammation of the kidneys and bladder, and in the scalding of urine in gonorrhoea. It has also been used successfully in asthma, cough, and chronic bronchitis, and appears to exert an influence principally upon the respiratory organs (Felter and Lioyd, 1898).

11. Parsley (*Petroselinum crispum*)

Parsley has been used medicinally since ancient times. It is rich in vitamins and minerals, particularly vitamins A and C, and compounds that clear toxins from the body. It also reduces inflammations, contains histamine inhibitors and is a free radical scavenger (McGee, 2006). Parsley's diuretic effect has also been recognized since ancient time. Its diuretic effects is mediated through an inhibitory action on the sodium-potassium pump, thereby enhancing sodium and water excretion while increasing potassium reabsorption (Kreydiyyeh and Usta, 2002). The essential oil apiole found in all parts of parsley is a proven kidney stimulant. It is also used as a tonic to strengthen the bladder (Anomymous, 2009). Parsley is a traditional remedy for colic, indigestion, and intestinal gas (Gruenwald, 1998). As a widely eaten food, parsley is generally regarded safe. However, excessive quantities of parsley should be avoided during pregnancy, because myristicin and apiol can stimulate the uterus (Tyler, 1994). Myristicin, an active component of parsely, may also cross the placenta and increase the heart rate of the fetus (Newall, 1996).

12. Juniper (*Juniperus osteosperma*)

Juniper berries have long been used as medicine in many cultures. Some of its important chemical components are alpha pinene, cadinene, camphene and terpineol. Juniper berries were used by native Americans as a herbal remedy for urinary tract infections, to treat diabetes and as a female contraceptive (McCabe *et al.*, 2005). Juniper contains aromatic compounds that increase the flow of urine. Its leaves are diuretic. This herb appears to work by increasing urinary volume and supposedly helping to flush bacteria out of the urinary tract (Blumenthal *et al.*, 1998). Juniper leaves contain terpenoids with antimicrobial action. Juniper berry is often used as a diuretic, antiseptic and stimulant. It is useful for the treatment of chronic cystitis but not used when there is acute inflammation because it

may cause irritation of bladder. Juniper leaves contain terpenoids with antimicrobial actions. Some terpenoids cause diuresis as well. Folkloric writings claim that juniper can be nephrotoxic. However, two separate reviews surmise that early reports of renal damage may have arisen either from contaminants or misidentification of plants thought to be juniper (Yarnell, 2002).

13. Amla (*Emblica officinalis)*

The fruit of *Emblica officinalis* commonly known as amla is highly valued in traditional Indian medicine (Scartezzini *et al.*, 2006). The fruit of *E. officinalis* is diuretic. In Unani medicine the dried fruits of amla are used to treat haemorrhage, diarrhoea and dysentery **(**Parrotta, 2001). It is adaptogenic (Rege *et al*., 1999), hepatoprotective (Jose and Kuttan, 2000), antitumor (Jose *et al*., 2001), hypocholestrolemic (Kim *et al*., 2005), antioxidant (Bhattacharya *et al*., 1999) and antiulcerogenic (Sairam *et al*., 2002). The fruits are also reported to be anti-inflammatory (Sharma *et al*., 2003), analgestic and antipyretic. Several constituents of *E. officinalis* fruit has been identified, mainly the hydrolysable tannins, emblicanin A, emblicanin B, punigluconin and pedunculagin (Perianayagam *et al.*, 2005). Emblicanin A and B have been found to be the active constituents with significant *in vitro* antioxidant activity (Ghosal *et al*., 1996).

Earlier studies have demonstrated potent antimicrobial properties of *E. officinalis* (Ahmed *et al*., 1998) and it is used as antiviral for cold and flu. In the respiratory infections, it has an antibiotic activity against a wide range of bacteria, used traditionally in the treatment of lungs (Chopra & Simon, 2000). It has also shown antifungal activity *in vitro* (Dutta *et al*., 1998). Active constituents of amla have been found to be active against *Staphylococcus aureus, Escherichia coli, Mycobacterium tuberculosis, Salmonella typhosa* and *Candida albicans* (Khanna and Nag, 1973).

14. Coriander (*Coriandrum sativum*)

Coriander is diuretic in nature (Equale *et al.*, 2006). Its leaves and seeds are used as seasoning condiment. Coriander seeds have health-supporting reputation that is high on the list of healing spices. It has traditionally been referred to as antidiabetic (Gray and Flatt, 1999), anti-inflammatory and cholesterol lowering (Chithra and Leelamma, 1997). In addition, it is also used as carminative, stimulant, stomachic, refrigerent, aphrodisiac, analgestic, antihelmintic (Equale *et al.*, 2006) and hypoglycemic (Waheed *et al.*, 2006).

The seeds of *C. sativum* contain 0.5-1 % essential oil and are rich in beneficial phytonutrients including carvone, geraniol, limonene, borneol, camphor, elemol and linalool. Coriander's flavonoides include quercitin, kaempferol, rhamnetin and epigenin. It also contains active phenolic acid compounds including caffeic and chlorogenic acid. Research also suggests that the volatile oils found in the leaves of *C. sativum* plant may have antimicrobial properties against food borne pathogens such as *Salmonella* species (Isao *et al.*, 2004). It has antibacterial activity against a wide range of respiratory pathogens and used traditionally in the treatment of respiratory infections (Chopra and Simon, 2000). The bioactive compounds, aliphatic 2E-alkenals and alkanals, isolated from fresh leaves of coriander were also found to possess bactericidal activity against *Salmonella choleraesuis* (Isao *et al*., 2004).

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