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**Cell : 9595 359 435, Ph No: 02172372010 Email: ayisrj@yahoo.in Website: www.isrj.net**



## Herbs In Treatment Of Urinary Tract Infections

**Manish Wasamwar , Vijay S.Wadhai and Gopal S. Gond**

Department of Microbiology, Sardar Patel Mahavidyalaya, Chandrapur (M.S.)  
Department of Biochemistry, Gurunanak College of Science, Ballarpur (M.S.)

### Abstract:

*It is known that urinary tract is very common source of infection and UTIs are second most common reason people visit their doctors each year. Escherichia coli is responsible for large majority of UTIs. UTIs is most commonly diagnosed bacterial infection in woman. Population at risk of complication include older woman, pregnant woman. Continuous antibiotics prophylaxis are used to treat and prevent recurrent urinary tract infections, frequent antibiotic use can result in vaginal and intestinal dysbiosis as well as antibiotic resistance. Thus, it is desirable to seek alternative methods of prevention and treatment of simple UTIs. Few herbal antimicrobial agents Vaccinium macrocarpon (Cranberry), Vaccinium myrtillus (Bilberry; Blueberry), Berberine, Arctostaphylos uva ursi (Bearberry) are proved to be very effective in preventing and treating urinary tract infections.*

### KEYWORD:

Urinary tract infection, Escherichia coli, Antibiotic resistance, Herbal remedy

### INTRODUCTION

Urinary tract infection is defined as the presence of multiplying micro-organisms in the tract through which urine flows from kidneys via bladder. UTI is a common urological disorder found in people of all age groups and geographical locations in both male and females. The condition of UTI ranges from mild infection such as cystitis to severe infections of the kidneys such as pyelonephritis (Nicolle LE ,2008). Clinical experience has indicated the presence of numerous cases of antibiotic resistance develops to common antibiotics by urinary tract causing microorganisms are found in both developed and developing countries (Gupta K ,2002). .

Urinary tract infections have been described since ancient times with the first documented description in the Ebers Papyrus in 1550 BC. (Al-Achi, Antoine,2008). It was described by the Egyptians as "sending forth heat from the bladder" (Wilson ,1990). Effective treatment did not occur until the development and availability of antibiotics in the 1930s before which time herbs were recommended(Al-Achi, Antoine,2008).

E. coli is the cause of 80–85% of urinary tract infections, with Staphylococcus saprophyticus being the cause in 5–10%.(Nicolle LE ,2008) Rarely they may be due to viral or fungal infections (Ambdekar S.,2011). Other bacterial causes includes Klebsiella, Proteus, Pseudomonas, and Enterobacter. These are uncommon and typically related to abnormalities of the urinary system or urinary catheterization (Salvatore S.,2011). Urinary tract infections due to Staphylococcus aureus typically occurs secondary to blood born infections (Lane DR ,2011).

Women are more prevalence to UTIs than men because, in females, the urethra is much shorter and closer to the anus. As a woman's estrogen levels decrease with menopause, her risk of urinary tract infections increases due to the loss of protective vaginal flora. In young sexually active women, sexual activity is the cause of 75–90% of bladder infections, with the risk of infection related to the frequency of

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sex (Nicolle LE ,2008). The bacteria that cause urinary tract infections typically enter the bladder via the urethra. However, infection may also occur via the blood or lymph. It is believed that the bacteria are usually transmitted to the urethra from the bowel, with females at greater risk due to their anatomy. After gaining entry to the bladder, E. Coli are able to attach to the bladder wall and form a bio-film that resists the body's immune response(Salvatore S.,2011).

Acute urinary tract infection is common in children. By the age of seven years, 8.4% of girls and 1.7% of boys will have suffered at least one episode. Death is now a rare complication but hospitalization is frequently required (40%), particularly in infancy. Transient damage to the kidneys occurs in about 40% of children affected and permanent damage occurs in about 5%, sometimes even following a single infection. Symptoms are systemic rather than localized in early childhood and consist of fever, lethargy, anorexia, and vomiting. UTI is caused by E.coli in over 80% of cases and treatment consists of a course of antibiotics (Coulthard ,1997).

Children who have had one infection are at risk of further infections. Recurrent UTI occurs in up to 30%. The risk factors for recurrent infection are vesicoureteric reflux (VUR), bladder instability and previous infections. Recurrence of UTI occurs more commonly in girls than boys (Winberg 1975). Due to the unpleasant acute illness caused by UTI and the risk of pyelonephritis-induced permanent kidney damage, many children are given long-term antibiotics aimed at preventing recurrence. Cotrimoxazole, nitrofurantoin and trimethoprim are commonly used for this purpose. These medications may cause side effects and promote the development of resistant bacteria (Winberg 1975).

Antibiotics provide the main basis for the therapy of microbial infections. Since the discovery of these antibiotics and their uses as chemotherapeutic agents there was a belief in the medical fraternity that this would lead to the eventual eradication of infectious diseases. But, worldwide emergence of resistant strains of E. coli and many other bacteria has become a major therapeutic problem at the recent time. In addition, multi-drug resistant strains of E. coli are also increasingly being isolated from community acquired infections. For thousands of years, natural products have been used in traditional medicine all over the world and predate the introduction of antibiotics and other modern drugs. (Md.Mehedi Hasan 2012). Clinical experience has indicated the presence of numerous cases of antibiotic resistance develops to common antibiotics by urinary tract causing microorganisms are found in both developed and developing countries (Gupta K ,2002). Resistant to newer and more potent antimicrobials are no exceptions, making the therapeutic options very limited to certain antimicrobial agents like carbapenem, colistin and fosfomycin. The updated knowledge and situation of the prevalence of multidrug resistance of bacteria causing urinary tract infection is a prime importance for proper use of antimicrobial agents and the policy making to multidrug resistance in urinary tract infection (Giamarellou H , 2010).

Gram-negative bacilli (Enterobacteracea) were responsible for urinary tract infections and most of the strains were multi-drugs resistant. The most common isolated bacteria from urinary tract infections was E. coli and the most effective antimicrobial agents were amikacin, tobramycin and ciprofloxacin against Gram-negative bacilli and also the most effective antibiotics against Gram-positive cocci were kanamycin, tobramycin and ciprofloxacin (Mansur Amin et.al., 2009).

E. coli accounts for 75% to 95% of urinary tract infections and urinary tract infections are among the most common infections in humans, with half of all women experiencing at least one in their lifetime. E. coli antimicrobial resistance is a major factor in determining health outcomes in patients with urinary tract infections. E. coli antimicrobial resistance has been associated with lower likelihood of clinical cure and increased risk of infection recurrence. Additionally, antimicrobial resistance significantly increases patient morbidity, costs of treatment, and rates of hospitalization. As antimicrobial resistance continues to increase, remaining antimicrobial drug options have a higher likelihood of causing unwanted side effects such as gastrointestinal distress, nausea, and vomiting. Due to a lack of drug development, the paucity of new antimicrobial drugs for common infections like urinary tract infections will continue to worsen in the near future(Guillermo V. Sanchez ,2012)

Urinary tract infection are classified as either asymptomatic or symptomatic. Urinary tract infection. Symptomatic Urinary tract infection include uncomplicated lower (cystitis) and upper Urinary tract infection (pyelonephritis) and complicated infections of the lower or upper urinary tract. In young women with uncomplicated lower UTI, many studies have shown that short-term treatments with antibiotics for 1 to 3 days are as effective and as the traditional longer treatments for 7 to 14 days for better results. However, the results from several studies and systematic reviews have shown that single-dose treatment is less effective than longer treatments. Most authors, including the Infectious Diseases Society of America, recommend a 3-day treatment for lower, uncomplicated urinary tract infection in young women (Norrby 1990). The critical quality assessment of the many published review articles on UTIs in older people, the overall methodological quality was low (mean score  $2.0 \pm 1.1$  on a scale of 9) (Lutters 2000). In particular, none of the identified reviews specified the methods of identifying, selecting and validating the

included information. The resulting treatment recommendations varied enormously, especially for the treatment duration for uncomplicated lower UTI in elderly women, which differed from 3 to 10 days. Many authors did not recommend short treatment (1 to 3 days) in elderly women because it is said to be less effective than in younger women (Baldassarre 1991). The bacteriological features of UTI also differ between elderly and young patients. *Escherichia coli* and *Staphylococcus saprophyticus* are the most common causative organisms of UTI in young adults, accounting for 80% to 90% of all cases (Winickoff 1981).

The diagnosis of asymptomatic bacteriuria should be based on the culture of a urine specimen collected in a manner that minimizes contamination. It is defined as two consecutively voided urine specimens with isolation of the same bacterial strain in quantitative counts of at least 100,000 colony-forming units/ml. Counts as low as 100 colony-forming units/ml are also considered significant bacteriuria if the specimen is catheterized urine. Bacteriuria occurs in 2% to 7% of pregnant women in the first trimester (Nicolle, 2003). Asymptomatic bacteriuria occurs in 5% to 10% of pregnancies, 20% to 30% of which progress to pyelonephritis if left untreated. Physiologic changes in pregnancy brought about by hormonal changes and uterine compression make the pregnant woman with asymptomatic bacteriuria particularly susceptible to the development of persistent and symptomatic urinary tract infection. The kidneys increase in length and filtration rate by 30% to 50%, increasing renal clearance of drugs and possibly decreasing the duration a drug stays in the urine. There is decreased peristalsis in the collecting systems and ureters and smooth muscle relaxation in the bladder, as well as mechanical obstruction by the enlarged uterus, promoting stasis of urine (Macejko, 2007).

While antibiotics are used to treat and prevent recurrent urinary tract infections, frequent antibiotic use can result in vaginal and intestinal dysbiosis as well as antibiotic resistance. Thus, it is desirable to seek alternative methods of prevention and treatment of simple UTIs. Few herbal antimicrobial agents are as below.

#### **VACCINIUM MACROCARPON (CRANBERRY)**

The cranberry has been used in folk medicine for centuries as a treatment for diseases of the urinary tract. It was once thought to benefit UTIs because hippuric acid in cranberries has the potential to acidify the urine. However, a more complete understanding of the pathogenesis of UTIs has led to a greater understanding of the mechanisms of action of cranberry in prevention and treatment – as an anti-adhesion agent. Cranberries have been found effective in the form of pure juice, sugared cocktail, and capsules and tableted extracts.

#### **VACCINIUM MYRTILLUS (BILBERRY; BLUEBERRY)**

Although *Vaccinium myrtillus* extracts have not been subjected to the same extensive study for UTIs as cranberry, evidence indicates constituents of blueberry juice possess some of the same anti-adhesive effects. Unlike guava, mango, orange, grapefruit, or pineapple, bilberry constituents can bind competitively to the same uroepithelial cells as bacteria. (Clement-Kruzel S, 2008) A study examined the effect of cranberry, blueberry, mango, melon, peach, plum, or raspberry on the ability of oral bacteria to aggregate and thus colonize. Although cranberry inhibited bacterial aggregation the most strongly, blueberry juice exhibited weak anti-aggregation effects; the other juices showed no effect (Hwang BY, 2003).

#### **BERBERINE**

Berberine is a plant alkaloid with a long history of medicinal use in both Ayurvedic and Chinese medicine. It is present in many plants, including *Hydrastis canadensis* (goldenseal), *Coptis chinensis* (Coptis or goldenthread), *Berberis aquifolium* (Oregon grape; Mahonia aquifolium), *Berberis vulgaris* (barberry), and *Berberis aristata* (tree turmeric). Berberine is found in the root, rhizome, and stem bark of the plants. Berberine extracts and decoctions demonstrate significant antimicrobial activity against a variety of organisms, including bacteria, viruses, fungi, protozoans, helminths, and Chlamydia.

#### **ARCTOSTAPHYLOS UVA URSI (BEARBERRY)**

*Uva ursi* is most commonly used antimicrobial botanicals for Urinary tract infection. The antimicrobial constituent of *uva ursi* is aglycone hydroquinone of arbutin, which is released in alkaline urine. (Blommaert KLJ, 1978) For optimum results, the urine pH should be at least 8. Increased urine



alkalinity can often be achieved by a high vegetable diet; however, in some cases consumption of 6-8 g sodium bicarbonate in water daily may be necessary. A study on uva ursi found a dried leaf extract resulted in significant urinary arbutin (64.8% of arbutin consumed in tablet form and 66.7% of arbutin in an aqueous solution). (Blumenthal M, 1998)

## OTHER HERBS

*Barosma betulina* (buchu) has been used from long period in urinary tract infections. In addition to its diuretic effect, in vitro evidence suggests it has an antimicrobial effect against certain urinary pathogens. It has been used traditionally for catarrhal cystitis and urethritis. (Lis-Balchin, M 2001) In an in vitro study, essential oil extracted from *Salvia officinalis* inhibited several urinary pathogens extracted from urine samples provided by individuals with UTIs. *Salvia* demonstrated 100-percent inhibition of *Klebsiella* and *Enterobacter* species, 96-percent inhibition of *E. coli*, 83-percent inhibition of *Proteus mirabilis*, and 75-percent inhibition of *Morganella morganii*. (Spreeth AD, 1976) While not directly impacting urinary tract infections, herbs such as *Sabal serrulata* (saw palmetto)

In the last three decades, there have been a lot of reports in the scientific literature on the inappropriate use of antimicrobial agents and the spread of bacterial infections. The changing patterns in the etiological agents of urinary tract pathogens and their sensitivities to commonly prescribed antibiotics are reported (Kurutepe et al., 2005). The emergence of antibiotic resistance in the management of UTIs is a serious public health issue, particularly in the developing world where apart from high level of poverty, ignorance and poor hygienic practices, there is also high prevalence of fake and spurious drugs of questionable quality in circulation.

## CONCLUSION

Review of literature explains the use of some plants by indigenous people against a number of infections since generations. Plants are potentially rich in antimicrobial compounds and have extensively been used by people. The millenarian use of plants in folk medicine suggests that herbs represent an economic and safe alternative for treatment of UTI.

It is concluded that some plants are used as antimicrobial agents. Antimicrobial potential of these plants against UTI causing pathogens needs extensive investigation to understand their antimicrobial principles which may allow the scientific community to recommend their use as accessible alternative to synthetic antibiotics, more importantly the development of herbal medicine as an alternative way may be incorporated in urological practice. It is hoped that our study will confirm earlier findings recorded in literature and also provide clues in this field of vital interests.

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