

# Indigenous wisdom of *Ayurvedic* drugs to treat Urinary tract infections

## Review Article

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### Abstract

Urinary tract infections (UTI) in all ages are related with high morbidity and long term difficulties. Use of antibiotics is useful in cases of UTI, consequently opposition of pathogenic microorganisms to antibiotics is of high clinical concern. According to Ayurveda drugs especially important components which have been utilized for the treatment of various diseases. The review paper highlighted different clinical studies and scientific studies which are useful to prove the adequacy of Ayurveda drugs against urinary tract infections. Ayurvedic drugs were reviewed in the current paper in the awake of evaluating their well being for the clinical condition like UTI. *Ayurvedic* medications showed good anti bacterial properties against both gram positive and negative microscopic organisms causing UTI. Other aspects are highlighted likewise mitigating, diuretic, cell reinforcement, nephroprotective and antiurolithiatic properties helpful in the administration of UTI and all medications are protected even in high dosages subsequently can be adequately utilized for UTI conditions. In this paper an attempt is made to highlight the research work of herbal drugs of Ayurveda which would be effective in the treatment of UTI.

**Key Words:** *Ayurveda, UTI, Ayurvedic drugs, Antibacterial.*

### Introduction

Urinary tract infection (UTI) is one of the major problem influencing individuals from all age groups including neonate to geriatric age. UTIs are among the most clinical condition causing infections through out the world with significant clinical and money related burden(1). Consistently around 150 million individuals are being determined to have urinary tract contamination around the world. In an estimation, about 60% females and 13% males are suffered from UTI and other related conditions (2).

Clinically, UTI is classified into two classes, uncomplicated and complicated. Uncomplicated UTI generally influences a sound person with no basic or neurological urinary tract anomalies, which incorporates cystitis and pyelonephritis. Complicated UTI is an important condition creating various disorders like renal obstacles, may cause renal failure or even neurological issues(3). Females are progressively defenseless to UTI when contrasted with males due to the short length of urethra, nonappearance of prostatic emission, pregnancy and simple sullyng of the tract with fecal flora(4). *Escherichia coli* is one of the most common form of bacteria causing UTI which represents up to 90% of

cases. Majority of UTI cases caused by the *Escherichia coli* (5), and rest by *Klebsiella*, *Enterobacter*, *Proteus*, *Pseudomonas*, *Enterococcus*, *Staphylococcus* and others can likewise causes of UTI(6). Other bacteria are likewise *proteus mirabilis*, *Klebsiella* species, *pseudomonas aeruginosa* and *Enterobacter* species can cause less infections. Gram-positive organisms are less basic which incorporates Group B *Streptococcus*, *Streptococcus aureus*, *streptococcus*, *saprophyticus* and *streptococcus*, *haemolyticus* (7).

UTI portrays microbial colonization and disease of structures of the urinary tract. As per the modern science the organs included in urinary system are Kidney, Ureter, Bladder and Urethra and UTI affected by the picture of pyelonephritis, cystitis and urethritis. (8). Antibiotics are acting on microscopic organisms causing regular diseases expanding in all areas of the world(9). It is intriguing that example of obstruction watched differs from medical clinic to network, enormous emergency clinic to little clinic, state to state, and even shift from nation to country (10). Emergence of protection from antibiotics shows significance of utilizing proof based techniques for the treatment(11). Use of anti-microbial agents in patients with UTI appears to lessen length of emergency clinic remain and accordingly shows tolerant effects with their costs(12). Hence there is need of such drugs having improved efficacy with minimum or no side effects and cost effective derivatives for the use in UTI(13-14).

Number of herbal formulations has been developed in Ayurveda to treat UTI to compete with need of all time availability, easy dispensing, palatability and efficacy(15). In *Ayurveda* all the indications of UTI are

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described under the term 'Mutrakruccha'. Ayurveda has given prime significance to *Mutravaha srotas* and its *vikaras* (Urinary tract infection and its related disorder) Being a framework liable for homeostasis of liquids in the body it likewise detoxifies the body. In *Mutraghata* and *Mutrakruccha*, *Krucchata* (dysuria) and *Mutra-vibandha* are at the same time present in any case, in *Mutrakruccha* there is predominance of *Krucchata* (16). It is a *Bastimarmagata vikara* (disease) which is intricately referenced in *Ayurvedic* works of art and *basti* being one among the *Trimarmas*, the executives of disarranges identified with it has a more noteworthy restorative importance (17). *Charak samhita* explained various herbal plants like *Gokshur*, *Vidarikand*, *Kamal*, *Neel kamal punarnava* in UTI in *Sutra sthan shadvirechan shata shritya adhaya*. Use of *paniya ksharas* are also suggested in urinary disorders (18). While *Ashtang Hridaya* explained drugs useful in UTI under *mutraghat chikitsa*.

### Aims and objectives

Hence present study is aimed to review the *Ayurvedic* herbal drugs and their efficacy described in UTI.

### Materials and methods

The internet search was done to find out scientific studies done on various *Ayurvedic* drugs as a usefulness as a potent urinary tract infection. Online database were used for the search of relevant ancient literature and research papers published. The key words used for the search were like *Ayurveda*, and therapeutic potential of *Ayurveda* herbal drugs. The research articles published in only English language were considered for the review. Ancient texts has been reviewed specially in the ancient *Ayurvedic* texts to find out the drugs mentioned having potential action in UTI.

## Observation and Results

Table- 1. Herbal drugs mentioned in ancient *Ayurvedic* texts for UTI

S.No.	Drugs Name	Latin Name	Part used	Reference
1	Kamal	<i>Nelumbo Nucifera [Garten]</i>	Flower,Root	C.S.Su. 4/34
2	Nil kamal	<i>Nymphaea nouchali [Garten]</i>	Flower,Root	C.S.Su. 4/34
3	Yashtimadhu	<i>Glycyrrhiza Glabra[L]</i>	Bark	C.S.Su. 4/34
4	Priynagu	<i>Callicarpa Macrophylla[Vahl]</i>	Fruit	C.S.Su. 4/34
5	Shatpatra	<i>Rosa centifolia [L]</i>	Fruit,leaves	C.S.Su. 4/34
6	Gokshur	<i>Tribulus terrestris[L]</i>	Fruit	C.S.Su. 4/35
7	Punarnava	<i>Boerhavia Diffusa[L]</i>	Root,leaves	C.S.Su. 4/35
8	Pashanbhed	<i>Bergenia Ligulata (Wall)</i>	Bark,root	C.S.Su. 4/35
9	Kasa	<i>Saccharum spontaneum[Linn.]</i>	Root	C.S.Su. 4/35
10	Vidarikanda	<i>Pueraria tuberosa[Dc.]</i>	Root	C.S.Su. 4/35
11	Darbha	<i>Desmostachya bipinnata[Stap.]</i>	Root	C.S.Su. 4/35
12	Dhataki	<i>Woodfordia fruticosa[L.]</i>	Fruit	C.S.Su. 4/35
13	Shobhanjan	<i>Moringa oleifera[Lam.]</i>	Bark,root	C.S.Su. 4/35
14	Bala	<i>Sida cordifolia [Burm.]</i>	Root	A.H.Chi. 11/2
15	Erand	<i>Ricinus communis [Linn.]</i>	Root	A.H.Chi. 11/2
16	Kulattha	<i>Vigna trilobata[L.]</i>	Fruit	A.H.Chi. 11/2
17	Yava	<i>Hordeum vulgare [Linn.]</i>	Root	A.H.Chi. 11/9
18	Kantakari	<i>Solanum xanthocarpum[Scharad.]</i>	Panchang	A.H.Chi. 11/11
19	Paribhadra	<i>Erythrina indica[Lamk.]</i>	Kshar	A.H.Chi. 11/14
20	Ashmantak	<i>Sesbania Grandiflora. [Linn.]</i>	Leaves	A.H.Chi. 11/15
21	Atibala	<i>Abitulon indicum[Link.]</i>	Root	A.H.Chi. 11/18
22	Ushir	<i>Vetiveria zizanioides (L.) Nash</i>	Root	A.H.Chi. 11/18
23	Bhallatak	<i>Semecarpus indicum[Linn.]</i>	Fruit	A.H.Chi. 11/18
24	Katphala	<i>Myrica nagi[Thumb]</i>	Fruit	A.H.Chi. 11/19
25	Shalimoola	<i>Desmodium gangeticum[D.C.]</i>		A.H.Chi. 11/22
26	Patala	<i>Stereospermum suaveolens[D.C.]</i>	Root	A.H.Chi. 11/23
27	Patha	<i>Cissampelos pareira[Linn.]</i>	Root	A.H.Chi. 11/23
28	Shirish	<i>Albizia lebbek [L.]</i>	Bark	A.H.Chi. 11/23
29	Guggul	<i>Commiphora mukul[Hook.ex.Stocks]</i>	Gum	A.H.Chi. 11/25
30	Marich	<i>Piper nigrum [Linn.]</i>	Fruit	A.H.Chi. 11/25
31	Kushta	<i>Saussuera lappa[C.B. Clarke.]</i>	Root	A.H.Chi. 11/25
32	Chitrak	<i>Plumbago zeylanica[Linn.]</i>	Root	A.H.Chi. 11/25
33	Haritaki	<i>Terminalia chebula[Retz.]</i>	Fruit	A.H.Chi. 11/33
34	Shatavari	<i>Asparagus racemosus[Willd.]</i>	Root	Y.Chi.Mutrakruccha 4-5
35	Bruhati	<i>Solanum indicum[L]</i>	Panchang	Y.Chi.Mutrakruccha 4-5
36	Sunthi	<i>Zingiber officinale [Roscoe ]</i>	Root	Y.Chi.Mutrakruccha 4-5
37	Amalaki	<i>Embllica officinalis [Garten.]</i>	Fruit	Y.Chi.Mutrakruccha 4-5

C.S.Su.Shad. —Charak Samhita, Sutra sthan, A.H.Chi.Ashtang hruday ,Chikitsa adhyaya, Y.Chi.Mutrakruccha—Yogratnakar Chikitsa sthan Mutrakruccha adhyay)

**Table -2 Some Important Ayurveda formulations mentioned in Ayurvedic texts for UTI**

S.no.	Name of the formulation	Indications	Reference (text)
1	<i>Trinetraakhya Ras</i>	<i>Mutrakrucha (UTI)</i>	<i>R.S.Mu.Chi.1-2</i>
2	<i>Varunadi lauh</i>	<i>Mutrakrucha (UTI), Ashmari (Calculi)</i>	<i>R.S.Mu.Chi.3-6</i>
3	<i>Mutrakruchhantak Ras</i>	<i>Mutrakruchha (UTI)</i>	<i>R.S.Mu.Chi.10-12</i>
4	<i>Trunpanchmula</i>	<i>Mutrakruchha (UTI)</i>	<i>B.R. Mu.Chi.10</i>
5	<i>Gokshur kwath</i>	<i>Mutrakruchha (UTI)</i>	<i>B.R.Mu.Chi.13</i>
6	<i>Haritakyadi yog</i>	<i>Mutrakruchha (UTI)</i>	<i>B.R.Mu.Chi.20</i>
7	<i>Duralabhadi kashaya</i>	<i>Mutrakruchha (UTI)</i>	<i>B.R. Mu.Chi.28</i>
8	<i>Eladi Churna</i>	<i>Mutrakruchha (UTI)</i>	<i>B.R. Mu.Chi.30</i>
9	<i>Tarkeshwar Ras</i>	<i>Mutrakruchha (UTI)</i>	<i>B.R. Mu.Chi.35</i>
10	<i>Varundya Lauh</i>	<i>Mutrakruchha (UTI), Bal vardhak</i>	<i>B.R. Mu.Chi.66</i>
11	<i>Chandrakala Ras</i>	<i>Mutrakruchha (UTI)</i>	<i>B.R. Mu.Chiki.67-75</i>

*R.S.Mu.Chi.-Rasendra sarsangrha Mutrakruchha chikitsa adhyay, B.R. Mu.Chi.-Bhaishjya ratnavali Mutrakruchha chikitsa adhyay*

### Researches on Ayurvedic herbal drugs useful in UTI *Allium sativum (Lahsun)*

A Kumar et al, studied the antibacterial activity of allicin from *Allium sativum* against antibiotic resistant uropathogens. *Lahsun (A. sativum)* was examined by circle dissemination technique against gram-positive and gram negative bacteria and results were found good for urinary tract of infections of patients(19). E.Y. Sukandar et al stated that at higher portion *allium sativum* even have no critical antagonistic occasion with no reaction on kidney and liver capacities just as the blood composition (20).

### *Coleus aromaticus (Pashanbhed)*

Rashmi Sahay Khare et al, studied that the oils of *Pashanbhed* have a good antibacterial activity with minimal inhibitory concentration (MIC) ranging from 0.5µl/ml -6µl/ml (21). Govindaraju Subramanian et al studied *Pashanbhed* can act against both Gram positive (*Bacillus subtilis*, *Staphylococcus aureus*, *Enterococcus faecalis*) and Gram negative (*Escherichia coli*, *Shigella sonnei*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Proteus vulgaris*) causing UTI (22).

### *Crataeva nurvala (Varun)*

*Crataeva* is likewise shown for ceaseless diseases of the urinary framework. Deshpande PJ et al in one a clinical report the larger part (85%) of patients with demonstrated interminable urinary tract contaminations were among indication in following a month of treatment with *Crataeva* decoction (23). Agrawal et al observed that the exploratory examination with decoction of *Crataeva nurvala*, it was uncovered that the medication is viable in the administration of urolithiasis which is viewed as one of the inclining factor for UTI (24). Bhattacharjee Atanu et al stated that there is no watched unfavorable impacts level (NOAEL) estimation of 2000 mg/kg body weight suggests that the medication is safe (25).

### *Coriandrum sativum (Dhanyak)*

Abderahim Aissaoui et al were studied that the crude aqueous extract of coriander sativum was

drastically increased diuresis, excretion of electrolytes, and glomerular filtration rate in a dose-dependent way. The mechanism of action of the plant extract was compared with the modern drug furosemide. (26).

### *Hemidesmus indicus (Sariva)*

Ratha et al observed that the *H.indicus* ethanolic root separate demonstrated most extreme zone of restraint against *escherichia coli*(27). M Gayathri et al studied that, it act as a antibacterial action against *staphylococcus aureus*, *pseudomonas aeruginosa*, *klebsiella pneumoniae*(28). Navneet B. Gadge et al found that single oral portion of watery and ethanolic concentrate of *H. indicus* root (200 mg/kg and 400 mg/kg per oral (p.o.) each) demonstrated the medication as diuretic agent(29). Kotnis M S et al in their study revealed that *Hemidesmus indicus* root was assessed against gentamycin incited renal toxicity and found that the lines demonstrating its Reno-defensive activity(30). Atal et al stated that the medicate is very protected at restorative portion. LD50 was seen as 2500mg/kg(31).

### *Moringa oleifera (Shigru)*

Karandikar GK et al Studied that *Shigru* decoction is a compelling solution for symptomatic help in UTIs because of the antibacterial and calming operators present in the plant(32). Dr B Akila et al and T Rastogi et al revealed that stem bark of *M. oleifera* has been tried against an assortment of microorganisms like *escherichia coli*, *staphylococcus aureus*, *bacillus cereus*, *pseudomonas aeruginosa*, and *proteus mirabilis*. It shows useful impact against *escherichia coli*(33-34). F. J. Vijayalakshmi, et al analyzed the antiurolithiatic activity of aerial extracts of *Shigru*(35). Chetia et al observed that the effect of *Shigru* is good in urinary tract infection(36). M Gul et al studies the Cell reinforcement activity of *shigru* (37). C pinar et al observed that the bark is compelling against oxidative stress created in UTI on account of phenolic component(38). M. R. Kumbhare et al estimated the of total phenolic content, cytotoxicity and invitro antioxidant activity of stem bark of *Moringa oleifera*. It was found that it repress adherence of microorganisms to the mass of the bladder by sloughing them off in urine(39).



***Nelumbo nucifera (Kamal)***

Chopra described in his book the useful part of *Kamal* is rhizome(40) while Mukherjee P. K et al described the flowers having medicinal property (41) and as well as have great diuretic properties(42). Brindha B et al observed that its rhizome, leaves and stem of the plant have antibacterial properties(43). Venkatesh B et al and Ou M were studied that the *kamal* is having powerful against numerous gram negative microscopic organisms causing urinary tract infections(44-45). Ku Lee et al suggested that the leaves were seen as compelling in the administration of hematuria (46). Wu Mj et al observed that the *kamal* act as a cancer prevention agent due to lotus alcohol produced using leaves and flowers(47) and rhizome additionally have great cancer prevention agent properties (48). Srivastava et al studied that the root extract of *Nelumbo nucifera* improves kidney work against gentamicin initiated nephrotoxicity(49). Nguyen Q suggests that its stems is very useful as nephro protective drug(50). Kuo YC et al; had been studied the antimicrobial properties of Blossoms of *N. nucefera* have demonstrated it to be compelling against *Staphylococcus aureus*, *pseudomonas aeruginosa*, *bacillus subtilis*(51). Kashiwada Y et al observed that in pediatric age of patients viral UTI may happen in immune compromised youngsters, particularly herpes zoster may give cystitis and lower urinary tract infections, *Nelumbo nucifera* was useful in this type of patients(52). Kunanusorn P et al, studied the properties against the *escherichia coli*, *enterococcus faecalis*, *xanthomonas campestris*, *streptococcus mutans*, *lactobacillus casei* and *lactobacillus acidophilus*(53).

***Nymphaea nouchali (Neelkamal)***

Vasu K et al observed that the *Neel kamal* ethanolic concentrate of leaves has demonstrated extensive antibacterial action against *escherichia coli*(54), K. Ammani et al studied the mitigating activity accordingly demonstrating it to be a viable medication against UTI (55). Mohan Maruga et al observed that no huge treatment related changes in any hematological or serological parameters or then again toxicity was seen for the plant(56).

***Solanum xanthocarpum (Kantakari)***

It posses antimicrobial activity against all the bacterial species specially *escherichia coli* and least against *klebsiella pneumoniae* (57). Alcohol, acetone and petroleum ether extract of *kantkari* stem, leaf and fruits *kantkari* exhibited potent antibacterial activity against *klebsiella pneumoniae* and *salmonella typhi*. (58). *S. xanthocarpum* methanolic fruit extracts at 5, 10 and 15 mg/ml showed significant inhibition against bacteria and fungi less than ampicillin or amphotericin B(59).

***Tribulus terrestris (Gokshur)***

*Gokshur* was traditionally used by *ayurvedic vaidyas* as a mild laxative, diuretic, urolithiasis, dysurea for treatment of urinary tract problems including cystitis, stones and infections. Anitha.K et al studied the all

parts of *T. terrestris* in center Asia appeared antibacterial movement against *enterococcus faecalis*, *streptococcus aureus*, *escherichia coli* and *pseudomonas aeruginosa*(60). Anita et al as well as Abbasoglu U et al, observed that foods grown from the ground of Indian *T. terrestris* were dynamic solely against *escherichia coli* and *streptococcus aureus* (60-61). Williamson EM et al studies the decoction (*kwatha*) of *Gokshur* was concentrated against gentamycin induced renal toxicity in albino rats and end up being a compelling nephroprotective function(62). Nagarkatti D.S et al observed it's powerful diuretic action (63). Singh R G studied the decoction of natural product in rats and alcoholic concentrate in albino rats were displayed diuretic effect(64). Gujral M.L. et.al, studied the toxicity of the drug, so it shown as a safe drug (65).

***Terminalia chebula (Haritaki)***

Tariq A. L. et al observed that ethanolic concentrate and acetone concentrate of product of *T. chebula* were act against *proteus vulgaris*. Both the concentrates showed great antimicrobial action against UTI related with *proteus vulgaris*(66). Chattopadhyay RR et al, revealed that *T. chebula* concentrate act as antimicrobial agent against *escherichia coli*, *pseudomonas aeruginosa*, *shigella flexineria*, and *streptococcus aureus*(67). Khan KH studied the toxicity of *T. Chebula* and observed that no toxicity and come to the conclusion that it's safe drug (68). Studies conducted by Sumit et. al reveals that *Terminalia chebula* can act against *staphylococcus aureus*, *bacillus subtilis*, *escherichia coli*, *streptococcus agalactiae*, *streptococcus uberis*, *salmonella* and *pseudomonas aeruginosa* at the interval of 24, 36, and 48 hours. (69).

**Researches on polyherbal formulations*****Chandanadi Churna***

D. H. Tambekar et al, studied this drug in genitourinary diseases and found that it has powerful antibacterial movement against *proteus vulgaris*, *klebsiella pneumoniae*, *escherichia coli*, *pseudomonas aeruginosa* and *staphylococcus aureus* (70).

***Chandanasaava***

Pravin kumar et al., have studies it's antibacterial property particularly compelling against *escherichia coli* and found it's useful (71). Pankaj dixit found that it has a alkalizing activity(72). S. Sekar et al, revealed it's diuretic property and *Chandnasava* is a powerful medication against UTI (73). Annadurai Vinothkanna et al, studied it's use in pediatrics and come with inference that it can be utilized successfully among pediatric age group(74).

***Punarnavasava***

Manisha Gharate et al studied the property of *Punarnavasava* as antipyretic(75). Mehdi Bin et al studied it as a analgesic(76). Vineeth T et al observed that it can be act against *proteus*, *klebsiella*, *pseudomonas*, *escherichia coli*, *enterococcus*. In addition no any harmfulness was noted with its utilization. In this manner demonstrating it to be a

protected medicine in UTI in all age bunch including children(77).

### **Shweta parpati**

Priya Bhat et al, observed that in lower urinary tract infection *shweta parpati* was given for 15 days in a 40 patients and the drug has shown marked relief for the symptoms. (78).

### **Trinapanchamula kwatha**

It is a compelling tranquilize usually utilized in urinary related infirmities in Ayurveda. S. Jayalakshmi et al, had been studied the antibacterial property of Trinapanchamula kwatha particularly against staphylococcus aureus, escherichia coli, mariniluteicoccus flavus, pseudomonas aurogenosa, bacillus subtilis(79).Jitendra D. Khot et al stated that the antibacterial property it further assistance with symptomatic alleviation in UTI by righteousness of its job in mitigating consuming micturition, decrease of epithelial cells and discharge cells in urine(80).S Jayalaksmi et al determined the antipyretic property of Trinapanchamula kwatha(81).

### **Ethno-medicinal uses of herbal drugs used in UTI**

Herbal drugs used by traditional healers play vital role to combat Urinary tract disorders in remote areas as they are safe, effective, inexpensive and easily available. Most of the tribes reside at remote villages have a deep knowledge of medicinal plants and collect the plants from adjoining forest areas for the treatment of local population( 82). Number of ethno medicinal survey studies conducted in India revealed the uses of herbal drugs by traditional healers in UTI. Chauhan *et al* describe the use *punarnava* root decoction in urinary stones (83). Sundaran *et al* found Rhizome Extract of *Zingiber officinale* used for Renal failure where as *Abutilon indicum* root powder is used as nephroprotective by the traditional healers (84). Narsingh Varma et al clinically tested that Gokshurdai yog is useful in early stages of urinary tract infection and gives symptomatic relief to the patients. (85)

### **Discussion**

UTI is an important clinical disorder in all ages and in both sex around the world. Despite the fact that few antibiotics agents are useful for the treatment. But the issue of medication is resistance and side effects due to long term utilization of drugs are very normal. Taking into consideration, the review of *Ayurvedic* drugs in UTI is done. *Ayurveda* drugs are help out in positive way and negligible side effects with less toxicity. The *Ayurvedic* drugs has been shown altogether powerful in controlling and mitigating clinical issues of *E. coli*, *Klebsiella* and *B. proteus* and mostly gram positive and gram negative microbes which can cause the UTI. The herbs like *T. terrestris*, *Craeteva narvula* etc do not cause loss of discharge of electrolytes as it may happen with different diuretics. *Ayurvedic* herbs as well as *Ayurvedic* formulations are helpful to improve the condition of UTI like dysuria and expanded recurrence.

The gainful reaction of medication was seen inside multi week of treatment and no untoward impacts were watched over the span of treatment. In this way, it can be presumed that *Ayurvedic* drugs are prudent, safe in the administration for UTI Patients.

### **Conclusion**

The current review involves that these *Ayurveda* drugs have antibacterial, cancer prevention agents, nephroprotective, alkalizing, diuretic, mitigating and hostile to urolithiatic properties with no harmfulness or symptoms and entanglements in both straightforward or multi tranquilize safe in UTI. These medications will deal with the UTI and furthermore decrease the odds of agonizing prick of anti-microbial. In this manner particular and cautious utilization of these *Ayurveda* drugs will end up being useful in UTI .Further research especially clinical data needs to be generated for wide use of these drugs and so called as evidence based medicines.

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