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Review Article

TRADITIONAL SIDDHA MEDICINAL HERBS USED IN THE TREATMENT URINARY TRACT INFECTION (*MUTHIRA KIRICHARAM*)- A NARRATIVE REVIEW

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ABSTRACT

Urinary tract infection is one the commonest bacterial infection in clinical practice. The infection mostly occurs in the lower part of urinary tract i.e., urinary bladder and urethra in which women are commonly affected due to the anatomical variation in urethra. UTI are primarily caused by gram-negative bacteria, but gram-positive bacteria may also be involved. The most common pathogen is *Escherichia coli* with the frequency rate of 33%, followed by *Klebsiella pneumoniae* (11%), *Staphylococcus aureus* (22.2%), *Pseudomonas sp.* (7.4%). UTI is commonly represented with the symptoms related to cystitis and pyelonephritis such as dysuria (painful urination), increased frequency of urine, supra pubic discomfort and pain in flanks, etc. As per Siddha text, UTI can be correlated with the terms *Muthira kiricharam* which has other synonyms such as *Neer surukku*, *Neer kadupu* etc. Various herbs have been mentioned in Siddha literatures for the treatment of UTI. The main aim of this review is to summarize the scientific evidences supporting the medicinal herbs mentioned in Siddha text for the treatment of UTI.

INTRODUCTION

Excretory system of our body plays an important role in removal of metabolic waste from the body to maintain homeostasis. A healthy individual is usually resistant to infections in urinary tract. Occurrence of UTI is 40% to 50% more in women than men in the ratio 8:1[1]. Some of the predisposing factors which are responsible for causing UTI are female sex, obstructive uropathy, severe vesico ureteric reflux, constipation, repeated catheterization, poor hygienic conditions and environment. They also contribute their roll in increasing the percentage of urinary tract infections[2].

Definition

Urinary tract infection is an infection in any part of the urinary tract. Anatomically UTI is classified into two categories namely lower tract infection and upper tract infection. Lower tract infection includes urethritis and cystitis whereas upper tract infection includes conditions like pyelonephritis, prostatitis, internal and perinephric abscesses[3].

Symptoms of a lower urinary tract infection include painful micturition, frequent urination, and feeling of incomplete voiding despite having an empty bladder. Superficial or mucosal infections include infection of urethra and urinary bladder, where as signify tissue invasion include pyelonephritis and renal suppuration [4].

Aetiology

Urinary tract infection (UTI) is a common medical complaint faced in our society. Urinary tract infections are caused by bacteria and other microorganisms. In females, 75-90% of all infections are caused by *Escherichia coli,* followed by *Klebsiella* and *Proteus*[5]. Adolescent and sexually active females are mostly infected by *Enterococcus species, Staphylococcus, Saprophyticus*. *Streptococcus* group B especially in neonates are included in other bacterial sources of UTI. Fungi (*Candida species*) may also cause UTIs. A rare cause of UTI is Adenovirus and it may cause haemorrhagic cystitis [2].

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Studies on Traditional Siddha Medicinal Plants used in the treatment of UTI

Table 1: Herbs Used For Treatment of UTI

S.No	Botanical Name	Tamil Name	Family
1.	*Abutilon indicum* Linn.	*Thuthi*	Malvaceae
2.	*Aerva lanata* Linn.	*Sirupeelai*	Amaranthaceae
3.	*Aloe vera* Burm.	*Kattraalai*	Asphodelaceae
4.	*Benincasa hispida* Cong.	*Venpoosanai*	Cucurbitaceae
5.	*Bombax malabaricum* DC.	*Ilavu*	Malvaceae
6.	*Borassus flabellifer* Linn.	*Panai*	Arecaceae
7.	*Buchanania lanzan* Spreng.	*Saraparuppu*	Anacardiaceae
8.	*Cassytha filiformis* Linn.	*Kotthaan*	Lauraceae
9.	*Cocculus hirsutus* Linn.	*Sirungattukodi*	Menispermaceae
10.	*Cucumis sativus* Linn.	*Vellari*	Cucurbitaceae
11.	*Cuminum cyminum* Linn.	*Jeeragam*	Apiaceae
12.	*Cynodon dactylon* Linn.	*Arugam pul*	Poaceae
13.	*Ficus carica* Linn.	*Simaiyatti*	Moraceae
14.	*Glycyrrhiza glabra* Linn.	*Athimadhuram*	Fabaceae
15.	*Gmelina arborea* Roxb.	*Nilakumil*	Lamiaceae
16.	*Gossypium arboreum* Linn.	*Sembaruthi*	Malvaceae
17.	*Hemidesmus indicus* R.Br.	*Nannari*	Asclepiadaceae
18.	*Hibiscus rosa-sinensis* Linn.	*Sembaruthi*	Malvaceae
19.	*Hordeum vulgare* Linn.	*Barley*	Poaceae
20.	*Hygrophila auriculata* Schumach.	*Neermulli*	Acanthaceae
21.	*Lagenaria siceraria* Standl.	*Suraikodi*	Cucurbitaceae
22.	*Michelia champaca* Baill.	*Shenbagam*	Magnoliaceae
23.	*Phyllanthus emblica* Linn.	*Nelli*	Euphorbiaceae
24.	*Physalis minima* Linn.	*Sodukkuthakkali*	Solanaceae
25.	*Pistia stratiotes* Linn.	*Akasathamarai*	Araceae
26.	*Portulaca quadrifolia* Linn.	*Pasarai*	Portulacaceae
27.	*Saccharum officinarum* Linn.	*Karumbu*	Poaceae
28.	*Solanum nigrum* Linn.	*Manatakkali*	Solanaceae
29.	*Strychnos potatorum* Linn.	*Thetran*	Loganiaceae
30.	*Tribulus terrestris* Linn.	*Nerunjil*	Zygophyllaceae

Table 2: Important Siddha Formulations mentioned in Siddha texts for UTI:

S.No	Name of the formulation	Reference (text)
1.	*Thratchathy Chooranam.*	Kannusamy Parambarai Vaithiyam, Pg-99.
2.	*Neer-Malakkattuku Nerunjimul Chooranam.*	Kannusamy Parambarai Vaithiyam, Pg-110.
3.	*Nannari Mathirai.*	Kannusamy Parambarai Vaithiyam, Pg-141.
4.	*Koozhpanda Legium.*	Kannusamy Parambarai Vaithiyam, Pg-168.
5.	*Nellikai Legium.*	Kannusamy Parambarai Vaithiyam, Pg- 182.
6.	*Moothanda Legium.*	Kannusamy Parambarai Vaithiyam, Pg- 195.

7.	*Sataveri Girutham.*	Kannusamy Parambarai Vaithiyam, Pg-241.
8.	*Aruganver Girutham.*	Kannusamy Parambarai Vaithiyam, Pg-242.
9.	*Koozhpanda Girutham.*	Kannusamy Parambarai Vaithiyam, Pg-246.
10.	*Karpoora Silasathu Parpam.*	Kannusamy Parambarai Vaithiyam, Pg-372.
11.	*Vedikara Silasathu Parpam.*	Kannusamy Parambarai Vaithiyam, Pg- 374.
12.	*Vengara Parpam.*	Kannusamy Parambarai Vaithiyam, Pg-375.
13.	*Seemai Kalnaar Parpam.*	Kannusamy Parambarai Vaithiyam, Pg-377.
14.	*Kaaravediuppu Parpam.*	Kannusamy Parambarai Vaithiyam, Pg-380.
15.	*Padigara Navaneetha Parpam.*	Kannusamy Parambarai Vaithiyam, Pg-381.
16.	*Padigara Parpam.*	Kannusamy Parambarai Vaithiyam, Pg-382.
17.	*Senalavana Parpam.*	Kannusamy Parambarai Vaithiyam, Pg-384.
18.	*Pavazha Parpam.*	Kannusamy Parambarai Vaithiyam, Pg-385.
19.	*Vellai Sangu Parpam.*	Kannusamy Parambarai Vaithiyam, Pg-389.
20.	*Aaradhara Parpam.*	Kannusamy Parambarai Vaithiyam, Pg-397.
21.	*Karudakal Parpam.*	Kannusamy Parambarai Vaithiyam, Pg-403.
22.	*ThaniMuthuchippi Parpam.*	Kannusamy Parambarai Vaithiyam, Pg-404.
23.	*Mirutharsingi Parpam.*	Kannusamy Parambarai Vaithiyam, Pg-404.
24.	*Chitranda Kalnaar Parpam.*	Kannusamy Parambarai Vaithiyam, Pg-405.
25.	*Abraha Parpam.*	Kannusamy Parambarai Vaithiyam, Pg-433.
26.	*Silasathu Parpam.*	Siddha Vaithiya Thiratu, Pg-106.
27.	*Nandukkal Parpam.*	Siddha Vaithiya Thiratu, Pg-125.
28.	*Kungiliya Parpam.*	Siddha Vaithiya Thiratu, Pg-126.
29.	*Padigavengara Parpam.*	Siddha Vaithiya Thiratu, Pg-127.
30.	*Vediuppu Chunam.*	Siddha Vaithiya Thiratu, Pg-159.
31.	*Thalesathy Chooranam.*	Siddha Vaithiya Thiratu, Pg-225.
32.	*Gandhaga Rasayanam.*	Siddha Vaithiya Thiratu, Pg-235.
33.	*Puliyarai Nei.*	Siddha Vaithiya Thiratu, Pg-251.
34.	*Kungiliya Vennai.*	Siddha Vaithiya Thiratu, Pg-257.
35.	*Nannari Manapagu.*	Siddha Vaithiya Thiratu, Pg-259.

Abutilon indicum (Thuthi)

Application in Siddha

Decoction (170ml) made of *Abutilon indicum* (*thuthi)* root-35g, *Vitis vinifera* (grapes) fruit- 17g, water- 700ml should be given twice daily to cure syphilitic fever (*Mehasuram*), dysuria and thirst[6].

Antimicrobial Study

The antimicrobial study of *Abutilon indicum* extract was done by agar well diffusion method at various concentrations against both Gram-positive and Gram-negative bacteria. The standard drug used in this study is Gentyamycin and Itraconazole. Antibacterial and antifungal property of the extract was determined by the zone of inhibition. The extracts exhibited the growth inhibitory activity in a dose dependent manner[7].

Aerva lanata (Sirupeelai)

General Property

It cures anaemia, menorrhagia, burning micturition, *Tridhosa*, anuria, urolithiasis, pricking pain in the intestine (*Kudarsoolai*), *Kuruthisoodu.*[6]

Antimicrobial Study

The ethanol and ethyl acetate extracts of *Aerva lanata* was tested for its antibacterial activity against certain microorganisms at different concentrations. The zone of inhibition obtained by the *Aervalanata* extract at a concentration of 1000µg/ml against gram positive bacteria like *Staphylococcus aureus, Bacillus subtilius*, and gram negative bacteria like *Escherichia coli, Klebseilla pneumonia* strains involved in the study was more in comparison to Gentamycin, at a concentration of 5µg/ml[8].

Aloe vera (Kattraalai)

Application in Siddha

Butter, sugar candy, *Piper cubeba* (*valmilagu*) powder are taken along with *Aloe vera* juice to reduce dysuria, itching all over the body and internal heat[6].

Antimicrobial Study

The antimicrobial study of *Aloe vera* was performed by cup plate diffusion method against certain microorganisms in variable doses. Methanol and petroleum ether extract shows significant activity against *E.coli*, *Candida* and *Klebisella pneumonia* respectively[9].

Benincasa hispida (Venpoosanai)

General Property

Benincasa hispida cures internal fever, diabetes mellitus, burning micturition, love philtre (*idumarunthu*), Bilious fever*(pithasuram), enbusuram*, *Peisori*, gleet, mental disturbances and *Verinoi* [6].

Antimicrobial Study

Benincasa hispida fruit extract was obtained using different solvents like methanol, ethyl acetate and chloroform. These extracts were subjected to test against certain pathogenic bacterial strains using the well diffusion method. These extract possess a minimum inhibition against bacteria and fungus [10].

Bombax malabaricum (Ilavu)

Application in Siddha

Decoction is prepared from bark of *Bombax malabaricum*-1/4 *Palam,* water-2 *Azhakku*. Daily 1/4-1/2 *Azhakku* decoction is taken twice or thrice a day to get rid of chronic ulcers, burning micturition, dysuria, anuria, leucorrhoea, diarrhoea and dysentry[6].

Antimicrobial Study

The antibacterial and antifungal property of the *Bombax malabaricum* bark extract was determined by agar diffusion method. The inhibitory activities are compared with standard drugs like Amoxycillin and Ketoconazole. Alcoholic extract show maximum zone of inhibition against E.coli (19.50±0.5000mm) than other extracts[11].

Borassus flabellifer (Panai)

General Property

Palm candy cures syphilitic fever (*Mehasuram*), dysuria and thirst[6].

Antimicrobial Study

The antimicrobial activity of palm candy was tested against various pathogens. The zone of inhibition against *Streptococcus pyogens* (10-11mm) and *Staphylococcus aureus* (8-9mm) at concentration of 5gm palm candy against *Staphylococcus aureus*. There is no inhibitory activity of Palm Candy against *Shigella sp* and *Candida albicans*[12].

Buchanania lanzan (Saraparuppu)

General Property

It cures dysuria, oliguria and mercurial poisoning[6].

Antimicrobial Study

Anti-bacterial and antifungal property of *Buchanania lanzan* was carried out with disc diffusion and well diffusion respectively. The chloroform extract shows maximum inhibiiton against *Pseudomoas aeruginosa* (20mm) and *Aspergillus niger* (22mm) compared to the standard drug ampicillin and ketoconazole[13].

Cassytha filiformis (Kotthaan)

General Property

It cures leucorrhoea, burning micturition, *Pitha* diseases and weakness (*Ayarchi*) [6].

Antimicrobial Study

Agar well diffusion method was carried for the antimicrobial screening of the extract from aerial parts of *Cassytha filiformis* against both gram-positive and gram-negative bacteria. The minimum inhibitory concentration of the methanolic extract against *E.coli* and *Pseudomonas aeruginosa* were 14.42±0.58 mg/ml and 13.33±1.1 mg/ml respectively. The extracts (except the n-Hexane extract) are active against gram negative bacteria. The antimicrobial activities of these extracts could be attributed to the presence of those phytochemicals with good antimicrobial potentials[14].

Cocculus hirsutus(Sirungattukodi)

Application in Siddha

Leaf juice of *Cocculus hirsutus* along with sugar is given for venereal diseases to reduce burning micturition and dysuria[6].

Antimicrobial study

Various extracts from the leaves, stem and root of *Cocculus hirsutus* have been evaluated for its antimicrobial property against microorganisms. The zone of inhibition for the benzene and methanol extract ranges from 8-16 mm and for petroleum ether, acetone and methanol extracts range from 9-21mm. Thus *Cocculus hirsutus* possess significant antimicrobial activity [15].

Cucumis sativus (Vellari)

General Property

It cures dysuria, eczema, urethritis (*Neerthulaithinavu*). Seeds cure anaemia, urolithiasis, fissure in urethral opening (*Neerpuzhaivedipu*), leucorrhoea and burning micturition[6].

Antimicrobial Study

The antibacterial capacity of *Cucumis sativus* leaf extracts were determined by well diffusion method against pathogenic bacteria. The zone of inhibition values of methanol extract from *Cucumis sativus* ranged from 9-20 at various concentrations.

The results were shown that the extracts were potentially powerful in inhibiting the microbial growth of pathogenic bacteria[16].

Cuminum cyminum (Jeeragam)

Application in Siddha

Legium prepared from cumin seeds 200g, dried *Aloe vera* 170g, palm jaggery 170g, cow's milk and ghee-required quantity, is taken regularly to reduce stomach pain, dysuria, heat, indigestion, conjunctivitis, burning sensation all over the body, anal discomfort and constipation[6].

Antimicrobial Study

C. cyminum essential oil was experimented for its antimicrobial effect using agar well diffusion method. The study result shows significant antimicrobial effect (1:100 v/v) against *S. aureus, E. coli, K. pneumonia, A. niger, C. albicans and F. oxysporum*[17].

Cyanodon dactylon (Arugam pul)

Application in Siddha

Decoction of *Cynodon dactylon* root ¼ *palam*, white pepper 10 nos. is taken along with butter-*paakalavu* to reduce mercurial ptyalism, anal discomfort, dysuria, renal calculi, venereal heat and burning micturition[6].

Antimicrobial Study

The antibacterial effect of leaves of Cyanodon dactylon extract shows growth of inhibition against pathogenic bacteria in dose dependent manner. The broad spectrum of antibacterial activity of these extracts was due to the presence of active principle like saponins in the extracts. In the present study, it was also observed that gram negative bacteria were more sensitive to most of the extracts tested compared to gram-positive bacteria[18].

Ficus carica (Simaiyatti)

General Property

The latex of *Ficus carica* cures *Pitha* disorders, diabetes, acute pain (*Soolai*) and hematuria[6].

Antimicrobial Study

MeOH, hexanoic, CHCl3 and EtOAc extracts from green fruit latex were investigated by Aref et al. (2010) for their in vitro antimicrobial proprieties against five bacteria species and seven strains of fungi. The EtOAc extract had inhibition effect on the multiplication of five bacteria species (*Enterococcus fecalis,Citobacterfreundei, P. aeruginosa, E. coli and P. mirabilis).* For the opportunist pathogenic yeasts, EtOAc and chlorophormic fractions showed a very strong inhibition (100%); MeOH fraction had a total inhibition against *C. albicans* (100%) at 500µg/ml and a negative effect against *Cryptococcus neoformans*. The leaves AC extracts showed antibacterial activity against *Staphylococcus species*, but were not effective against *P. syringae*. The extract possessed antifungal activity against *Fusariumsolani, F. lareritium, F. roseum, Daporuthenonurai and Bipolarisleersiae* (Shirata and Takabashi, 1982) [19].

Glycyrrhiza glabra Linn (Athimadhuram)

Application in Siddha

Legium is prepared from *Glycyrrhiza glabra*-72g, cow's milk -750ml, ghee- 750ml, sugar-750g. *Kottaipakkalavu* legium is taken twice a day to reduce burning micturition[6].

Antimicrobial Study

Antimicrobial screening of aqueous and ethanolic extract of *Glycyrrhiza* roots were carried out against Gram +ve, Gram –ve bacteria and fungus like *Candida*. On comparison with the vehicle dimethyl formate the above extracts show significant antibacterial and antifungal activity [20].

Gmelina arborea (Nilakumil)

Application in Siddha

Leaf and spruce of *Gmelina arborea* become viscous when washed with water. This viscous fluid cures venereal heat, cystitis and dysuria[6].

Antimicrobial Study

Gmelina arborea extract was evaluated for its antimicrobial activity using agar diffusion method. The extract possesses significant inhibitory effect against pathogens *E.coli, Klebsiella pneumonieae, Proteus mirabilis, Shigella dysenteriea and Salmonella typhi*. The effectiveness of the extracts was more in the acidic than in alkaline conditions and also increased with increase in temperature[21].

Gossypium arboreum (Sembaruthi)

Application in Siddha

Leaf paste along with milk should be given to reduce burning micturition, dysuria and anuria[6].

Antimicrobial Study

The aqueous, ethanol and methanol extracts of *Combratum mole* and *Gossypium arboreum* were experimented for its antibacterial effect using agar diffusion procedure. From the results obtained it has been determined that *G.arboreum* show higher degree of inhibition than *C.mole* [22].

Hemidesmus indicus (Nannari)

Application in Siddha

Dried powder of *Hemidesmus indicus* root is taken along with cow's milk for dysuria. Decoction of nannari root and cumin seeds is given to cure dysuria[6].

Antimicrobial Study

The extract of *Hemidesmus indicus* root, *Ficus bengalensis* and *Pterocarpus marsupium* bark was in involved in antimicrobial screening against pathogenic bacteria in an in vitro condition. The minimum inhibitory concentration of *Pterocarpus marsupium*

ranges from 0.04 mg to 0.08 mg and the range for *F. bengalensis* and *H. indicus* was 0.04 mg to 0.1mg[23].

Hibiscus rosa-sinensis (Sembaruthi)

Application in Siddha

Dried powder of *Hibiscus rosa-sinensis* flower bud should be taken regularly to reduce burning micturition[6].

Antimicrobial Study

The antibacterial activity of *H. rosa-sinensis* flower extract was determined by in-vitro method against pathogens like *E. coli*, *B. subtillis*, *P. aeruginosa*, *S. aureus*, *Streptococcus* sp. And *Salmonella* sp. The antibacterial effect is evaluated by zone of inhibition. Phenolic compounds like tannins present in the flower extract are very good antimicrobial agent[24].

***Hordeum vulgare* (Barley)**

Application in Siddha

Barley porridge is used to reduce cough and burning micturition[6].

Antimicrobial Study

Antimicrobial screening of barley extract is done against *Candida albicans, Bacillus subtilis, E.coli, Saccharomyces cerevisiae* using well method.The results showed that it has maximum inhibitory affect against *Candida albicans* using well method (Madineni, 2012) [25].

Hygrophila auriculata (Neermulli)

General Property

Seeds of *Hygrophila auriculata* provides strength. It cures piles, syphilis (*Megham*), body heat and burning micturition[6].

Antimicrobial Study

Methanol and aqueous extracts of *H.auriculata* are screened for its antibacterial effect against pathogenic microorganisms. The methanol extract is highly effective with low MIC value 0.125µg/ml against *S.aureus*. The results support the view that methanol extracts had comparatively more inhibition action than aqueous extracts (Hugo et al., 2005) [26].

Lagenaria siceraria(Suraikodi)

Application in Siddha

Decoction of climber is given to reduce swelling and anuria. It has diuretic action[6].

Antimicrobial Study

Antimicrobial screening of n-hexane extract of *Lagenaria siceraria* against pathogenic bacteria was done by disc diffusion method. The results obtained were compared with that of a standard antibiotic, kanamycin which possess significant action against E.coli and S.typhi. But there was no antimicrobial activity against *Vibrio cholera*, *Bacillus cereus*, *Bacillus subtilis*, and *Staphylococcus aureus*[27].

Michelia champaca (Shenbagam)

Application in Siddha

Decoction of flower is used to cure peptic ulcer, fever, nausea, leucorrhoea and dysuria[6].

Antimicrobial Study

The extract of *Michelia champaca* was experimented for its antimicrobial activity by disc diffusion method. As per the study results, the zone of inhibition range for *E.coli*, *S.aureus* and *S.typhimurium* was 22.5mm, 26.5mm and 7mm respectively. Thus the results indicate that the M.champaca act as a broad spectrum antimicrobial agent [28].

Phyllanthus emblica (Nelli)

Application in Siddha

Nellikailegium: Decoction is made from nellivatral 2100g, water 45L and add sugar 855g to it to obtain paagu consistency. To the above add paste of *Glycyrrhiza*, *kookaineeru,* dried grapes (each 105g), ghee, honey and mix it. The obtained legium is taken *punnaikaialavu* for vomiting, jaundice, anaemia, dryness, anasarca, oliguria, ulcer and burning sensation[6]

Antimicrobial Study

Antimicrobial effect of *P.emblica* fruit extract has been determined against gram positive and gram negative bacteria like *Staphylococcus aureus* and *E.coli*. Alcoholic and aqueous extracts of *Phyllanthus emblica* showed positive results against common human pathogens including bacteria and fungi[29].

Physalis minima (Sodukkuthakkali)

General Property

It cures syphilis, burning micturition and inflammation[6].

Antimicrobial study

Antibacterial potential of P.minima is determined using streak plate, well diffusion and bio-autographic methods against microorganisms. Bio-autography assay showed polar compounds present in the crude extract are responsible for the antimicrobial action[30].

Pistia stratiotes (Akasathamarai)

General Property

It cures chancroid (*Azhukiranthi*), eczema, dysuria, piles, dysentery, dry cough and inflammation[6].

Antimicrobial Study

Antimicrobial activity of *Pistia stratiotes* leaf extract is done by well diffusion method and MIC (Minimum Inhibitory Concentration) using plate method. The zone of inhibition against *E. coli*, *S. Aureus, P. Aeruginosa* and *B. Subtilis* are 9.00 ± 0.817, 8.00±0.00, 8.33± 0.47 and 9.33± 0.47 respectively[31].

Portulaca quadrifolia (Pasarai)

General Property

It cures dysuria, anuria, leucorrhoea, tastelessness and vomiting[6].

Antimicrobial Study

Antibacterial activity of different extracts from the aerial parts of *P. quadrifda* was demonstrated against pathogenic bacteria. The methanol extract of *Portulaca quadrifda* possess significant antimicrobial activity against *Escherichia coli, Klebsiella pneumonia, Staphylococcus pyogenes* and *Staphylococcus aureus.*[32].

Saccharum officinarum(Karumbu)

Application in Siddha

Decoction of *Saccharum officinarum* root is given to cure burning micturition[6].

Antimicrobial Study

Disc diffusion method was undertaken for the evaluation of antimicrobial activity of of *Saccharum officinarum*. The result of the study shows maximum inhibitory effect of the aqueous ethanolic extract on *Escherichia coli* and *Pseudomonas aeruginosa* and minimal inhibitory effect on *Staphylococcus aureus* [33].

Solanum nigrum (Manatakkali)

Application in Siddha

Dried *Solanum nigrum* 136g is soaked in 700ml hot water for 1 hour and filtered. The 35-80ml filtrate is used to cure sinusitis and dysuria[6].

Antimicrobial Study

The ethanol and methanol extracts of stem, berries and whole plant of *Solanum nigrum* were experimented for its antibacterial activity certain pathogens. The zone of inhibition of methanol extract is more compared to the ethanol extract against *Bacillus subtilis*, *Escherichia coli, Klebsiella pneumonia* and *Pseudomonas aeruginosa.* In both extracts, whole plant extract showed potential anti-bacterial activity than stem and berries[34].

Strychnos potatorum (Thetran)

Application in Siddha

Strychnos potatorum seed powder is taken along with milk to reduce dysuria, venereal heat and diabetes[6].

Antimicrobial Study

The In Vitro antibacterial activity of different seed extracts of *Strychnos potatorum* was evaluated against *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *E coli* and *Enterococcus faecalis* using the standard agar well diffusion method. The results show that the *Strychnos potatorum* extract possess a significant antibacterial activity against both gram positive and gram negative bacteria [35].

Tribulus terrestris (Nerunjil)

General Property

It cures anuria, burning micturition, dysuria and urolithiasis[6].

Application in Siddha

Porridge prepared with fruit and root of *Tribulus terrestris* and raw rice is given to reduce leucorrhoea and dysuria. Crushed *Tribulus terrestris* fruit 68g, coriander seed 8g, water 680g is boiled and reduced to half and filtered. 40ml of this decoction is taken to reduce anuria, urolithiasis and burning micturition[6].

Antimicrobial Study

The methanolic leaf extract of *Tribulus terrestris* was subjected to *in vitro* antimicrobial screening against micro-organisms by agar plate diffusion and nutrient broth dilution techniques. The extract showed a minimum inhibitory concentration against *Salmonella typhi* was 3.125mg/ml, while against *Escherichi coli*, *Klebsiella* sp., *Pseudomonas aeruginosa* and *Candida albicans* was 6.250mg/mL [36].

CONCLUSION

Urinary Tract Infection (UTI) is the commonest clinical disorder which affects people all over the world. In modern system of medicine, numerous antibiotics are available for the treatment of UTI. Naturally medicinal herbs are safe, effective and are known to have lesser side effects. The current review illustrates the Siddha herbs with anti-microbial activity which is effective against both gram-positive and gram-negative bacteria like *Stahylococcus aureus*, *Escherichia coli*, etc. which are the main threat for causing UTI, thereby helps in reducing the symptoms and effective in treatment of UTI.

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