



Research Article

PRELIMINARY ANTIMICROBIAL STUDY OF *KANTAKARI (SOLANUM XANTHOCARPUM SCHRAD & WENDL)* BY DITCH PLATE TECHNIQUE

Shintre Sayali^{1*}, Ramteke Ashok², Phadke Manju³, Parab Vivek⁴

¹Assistant Professor, Dept. of Dravyagunvigyan, School of Ayurveda, Dr.D.Y.Patil Deemed to be University, Nerul, Navi Mumbai, Maharashtra, India.

²Professor and H.O.D, Dept. of Dravyagunvigyan, Ayurvedmahavidyalaya, Sion, Mumbai, Maharashtra, India.

³Associate Professor, Department of Microbiology, S.I.E.S College, Mumbai, Maharashtra, India.

⁴PhD Scholar, Department of Microbiology, S.I.E.S College, Mumbai, Maharashtra, India.

ABSTRACT

Lower Urinary tract Infection (Lower UTI) is the second most common infection in human population. *Escherichia coli* is one of the microbial strain responsible for lower UTI in most of the cases. Standard antibiotics can control the infection but there is recurrence of episodes in many cases. Constant research is carried out in this field to discover new antimicrobial agents. It is difficult for the microorganisms to acquire resistance to herbs and the polycompounds in them. They may make potential and promising antimicrobial agents references from classical text of Ayurveda suggest *Kantakari (Solanum xanthocarpum Schrad & Wendl)* to be effective in urinary disorders. The antimicrobial activity of *Kantakari* was studied *invitro* in its traditional forms that is *Swaras* (juice), *Kalka* (paste) and *Chuna* (powder) against the strains of *Escherichia coli*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Candida albicans*. The study was carried out by using ditch plate technique and zones of inhibition were measured and statistically analyzed. It was observed that juice form and paste were more effective than powder form. *Escherichia coli* strain was found to be sensitive to the juice, paste and powder samples of *Kantakari*. *Klebsiella pneumoniae* showed intermediate resistance as compared to other organisms. In conclusion of this study it was found that *Kantakari* has good antimicrobial potential and must be studied further.

KEYWORDS: *Kantakari*, Antimicrobial activity, Lower urinary tract infection, Ditch plate technique.

INTRODUCTION

Infectious diseases still possess a threat to mankind. Many drugs that were effective few years ago are becoming useless due to resistance developed to them from microbial world. Urinary tract infection is the second most common infection affecting human beings. It is a distressing condition in acute stages and could be resolved with antibiotic therapy. But it may become fatal in chronic conditions as the infection spreads to the renal parenchyma. It is the fact that 40% to 50% of population will suffer at least one clinical episode during their lifetime. Ayurveda is the treasure of herbal drugs. It offers great opportunity for research. Various herbal extracts have been studied in-vitro for their antimicrobial activities. However there is a need of ethno medical approach while dealing with herbs. Thus, herb *Kantakari (Solanum xanthocarpum S & W)*

was studied for its antimicrobial activity in its traditional form. It is a prostrate herb covered with sharp yellowish spines and belongs to Solanaceae family. It is a prostrate, diffuse, highly prickly perennial undershrub, woody at base with zigzag branches that spread close to the ground. Stem is profusely branched, highly prickly, covered with strong, broad sharp, compressed, straight yellowish white prickles. Leaves are alternate, ex-stipulate, petiolate, petiole almost 2 to 2.5 cm long, prickly stellately pubescent. Lamina is simple about 8-10cm x 5-6cm, base rounded, unequal sided, armed on midrib and the nerves with long yellow sharp prickles, stellately hairy when young. Inflorescence-Flowers are in extra-axillary cymes. Flowers-Complete, regular, actinomorphic, hypogynous, shortly pedicillate, attractive about 2.3 cm in

diameter. Calyx- Sepals 5, united at the base, forming short tube. Corolla-Petals 5, united, corolla bright purple, hairy on outer surface. Fruits- Berry, yellow, globular, 1cm in diameter, persistent calyx at the base, unripe fruits-variegated with green white. Seed- Many, small, reniform; smooth and yellowish brown.^[3] *Kantakari* is suggested to be good drug in urinary problems according to Ayurvedic classical text. This herb is a potential diuretic. The plant contains certain alkaloids, Sterols, Saponins, Flavonoids, glycosides, Carbohydrates and Fatty acids and Amino acids. It shows presence of other entities like Coumarin, β -sitosterol, solasodine. *Kantakari* also finds importance in ethnomedicine.^[16] Previous in-vitro studies of *Solanum Xanthocarpum* S & W extracts have shown antimicrobial activity against *E.coli* & *Klebsiellasp* etc., which are the common organisms responsible for causing urinary tract infections.^[10,17] Though Ayurveda has not suggested any particular activity like this, it has accepted the existence of these entities (microorganisms) through various references like *Krimi*, *Raksoha*, *Graham*, *Jantu* etc.^[12]

MATERIAL AND METHODS

The fresh specimen *Panchang* of herb (all parts-leaves, roots, stem, fruits, flowers) were collected from Panvel and authenticated at Blatter herbarium, St Xavier's college. The drug was made into traditional forms-*Swaras* (juice), *Kalka* (paste) and *Churna* (powder), as per API guidelines at A.P.M.'s Ayurved Mahavidyalaya, Sion, Mumbai. Standardization was done at Alarsin pharmaceuticals. In-vitro studies were carried out on samples at Department of Microbiology, S.I.E.S College, Sion, Mumbai-22. Antimicrobial Susceptibility Testing (AST) was used to determine the efficacy of potent herb against number of microorganisms. It was done using Ditch plate technique on *Swaras*, *Kalka* and *Churna* form of *Kantakari*.

Preparation of *Kantakari Swaras* (Juice)

Swaras was prepared by grinding the fresh herb *Panchang* (whole plant) and sieving it and stored in sterile, airtight container till use.^[3]

Preparation of *Kantakari Kalka* (Paste)

Fresh herb of *Kantakari* was washed and *Kalka* of its *Panchang* was prepared traditionally on stone grinder and roller and stored in sterile, airtight container till use.^[3]

Preparation of *Kantakari Churna* (Powder)

The herbal *Panchang* was cleaned, shade dried and subjected to hot air oven at 120°C

temperature and grinded in mixer into powder. It was then stored in sterile, airtight container till use.^[3]

Ditch plate technique

This method is a type of agar diffusion method, first developed by Alexander Fleming in 1929. He cut a strip of agar in the shape of a ditch from a Petri dish and replaced it with medium containing the extract of potential antimicrobial activity. He streaked different microbial strains at right angles across the ditch. He observed 'lanes' of inhibition and concluded the lane in streak of microbial strain that was farthest from ditch represented the antimicrobial activity against that strain.^[4]

Ditch plate technique method

A ditch was made on sterile nutrient agar and ditch was filled with the test drug under sterile conditions. Sterile nutrient agar plates were checked for each drug sample (namely, I-*Churna* (powder), II-*Kalka* (paste), III-*Swaras* (juice)). The microbial strains to be tested (*Escherichia coli*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Candida albicans*) were streaked across the ditch. The agar plates were incubated for 37°C for 24 hours. The plates were then observed for growth. Zones of inhibition were calculated and mentioned in millimeters (mm). A zone of inhibition observed provides a measurable sensitivity of test culture towards the antimicrobial compound.

RESULTS & DISCUSSION

Results of antimicrobial activity of *Kantakari* (*Solanum xanthocarpum* Schrad & Wendl) by ditch plate technique showed juice (*Swaras*) form to be consistent in having anti-bacterial as well as anti-mycotic effect against concerned test organism. Paste (*Kalka*) and powder (*Churna*) form followed it in antimicrobial effect (Table.1). Statistical analysis (ANOVA test) showed significance in Juice and powder form ($p < 0.05$) and in between paste and powder form ($p < 0.05$). However, there was no significance between juice and paste form ($p > 0.05$). Both Juice and paste form shown significant antimicrobial activity. Unpaired t test was insignificant for test organisms (A, B, E) owing to very few values. The test difference between microorganism strain (A) *E.coli* and (B) *K.pneumoniae* can be considered significant at 10% error. By observing the difference on the graph, *Escherichia coli* displayed good sensitivity to all the three *Kantakari* samples (Fig. 4).



Fig 1: Kantakari plant used for current antimicrobial studies

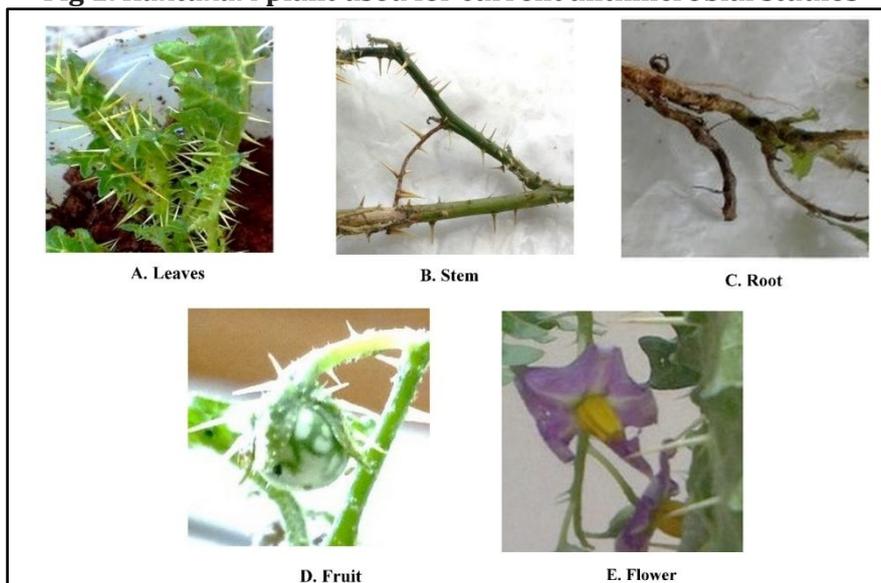


Fig 2: Panchang of Kantakari

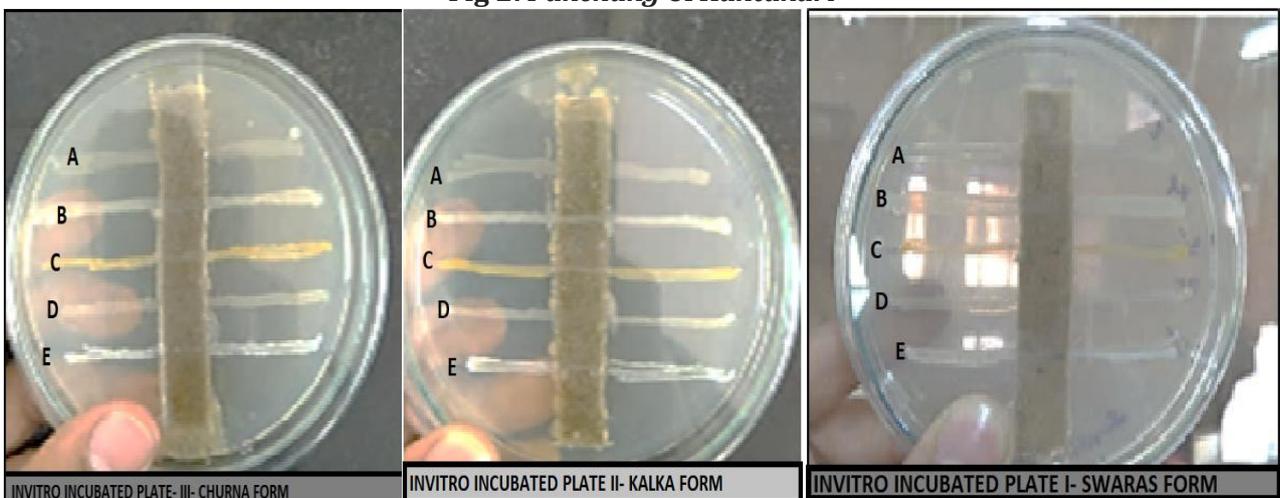


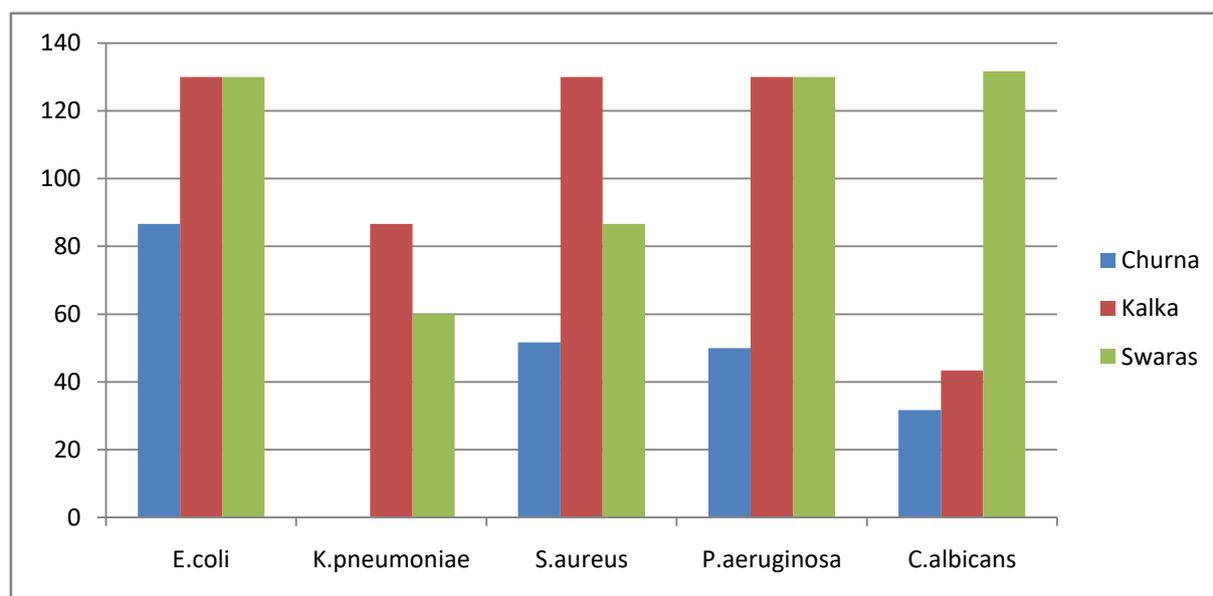
Fig 3: invitro antimicrobial activity- dich plate technique

[(From left- *Churna*, *Kalka*, *Swaras*), Test organisms- A-*E.coli*, B-*K.pneumoniae*, C-*S.aureus*, D-*P.aeuruginosa*, E- *C.albicans*]

Table 1: Result of Zone of inhibition of three samples of *Kantakari* against test organisms

Test organisms	Sample 1-Powder (<i>Churna</i>) form of <i>Kantakari</i>			Sample 2- Paste (<i>Kalka</i>) form of <i>Kantakari</i>			Sample 3- Juice (<i>Swaras</i>) form of <i>Kantakari</i>		
	Growth inhibition (in mm)			Growth inhibition (in mm)			Growth inhibition (in mm)		
	Plate 1	Plate 2	Plate 3	Plate 1	Plate 2	Plate 3	Plate 1	Plate 2	Plate 3
A. <i>Escherichia coli</i>	130	130	-	130	130	130	130	130	130
B. <i>Klebsiella Pneumoniae</i>	-	-	-	-	130	130	-	130	50
C. <i>Staphylococcus Aureus</i>	-	155	-	130	130	130	130	130	-
D. <i>Pseudomonas Aeruginosa</i>	-	150	-	130	130	130	130	130	130
E. <i>Candida Albicans</i>	-	95	-	-	130	-	130	130	135

(Note '-' indicates no growth/scanty growth in presence of sample and no inhibition of growth).

**Fig 4: Graphical representation of Zone of inhibition (in mm)**

CONCLUSION

Ayurveda focuses on administration of whole herb in its crude traditional forms that vary in their concentrations and phytoconstituents. *Kantakari* is a well-known herb used in this system of medicine since years, rich in diverse phytochemicals like Solasodine, Solanine, Carpesterol and other secondary alkaloids etc. This study has proved the antimicrobial potential of *Panchang* of this drug in traditional juice (*Swaras*) form against *E.coli* which is responsible for causing Urinary tract infection, as its use is suggested by Ayurveda in urinary infections. This work is a preliminary study of herb *Kantakari Panchang* for antimicrobial activity in its traditional form. It is necessary to verify the classical as well as ethno medicinal claims of herbs in their traditional forms with help of *invitro* and other advanced studies.

ACKNOWLEDGEMENTS

We acknowledge Mr. Praveen Kale, Blatter Herbarium, St Xavier's College, Mumbai; Department of Rasashastra, Ayurved Mahavidyalaya, Sion,

Mumbai; Mr. Mahesh Atale, Alarasin pharmaceuticals and Miss Ashwini Wakale, Statistician, Dr. D.Y.Patil deemed to be University for their timely assistance in this work.

REFERENCES

1. Ambikadutt Shastri; Sushrut samhita- (Vol 1 &2, reprint edition 2014; Chaukhamba Sanskrit Sansthan. pp.551-555.
2. A. Suganya, D. Jegadeeshkumar and D. Ravi. Evaluation of Antimicrobial activity of Solanum xanthocarpum against Betalactamase and Biofilm producing Microorganisms- International Journal of Novel Trends in Pharmaceutical Sciences, 2014, 4,6,188-193.
3. Ayurvedic Pharmacopoeia of India part-I volume-I Government of India, Ministry of Health and Family welfare; Department of AYUSH.
4. Balows A., Hausler W.J., Ohashi M., Turano A., Lennete E.H. (eds) (Amsterdam D. (1988) Principles of Antibiotic Testing in the

- Laboratory. In: Laboratory Diagnosis of Infectious Diseases. Springer, New York, NY)
5. Brahmanada Tripathi; Charaka samhita- (Vol 1, vol 2, 4th edition (1995); Chaukhamba Surbharati Prakashan, Varanasi. pp.56-80
 6. Datta k. Animesh et al; An Updated overview on *Solanum xanthocarpum* Schrad & Wendl- IJRAP 2011;2(3) 730-735.
 7. Dr Ganesh Krishna Garde; Saartha Vagbhat (Ashtanghridaya)-(2003 reprint; Anmol Prakashan, Pune. pp.323-327.
 8. Dr K.C.Chunekar (Commentary); Edited by Dr G.S.Pandey; Bhavprakashnighantu- (Chaukhamba Bharati Academy, c, Reprint-2006. pp.290-292
 9. Indian Medicinal Plants Volume 5- Vaidyaratnam P.S.Varier's Aryavaidyasala, Kottakal; Orient longman ltd;1996. pp.1762
 10. Abbas K, Niaz U, Hussain T, Saeed MA, Javaid Z, Idrees A, Rasool S. Antimicrobial activity of fruits of *Solanum nigrum* and *Solanum xanthocarpum*- Acta polonea pharmaceutica- Drug research, 2014 May-Jun;71(3):415-21.
 11. K.RSrikantha Murthy; Ashtangasangraha of Vagbhata (Vol 2- 2nd edition; Chaukhamba Orientalia, Varanasi. pp. 726-780.
 12. Kurele Rajeev kumar; Dhiman K.S; Comprehensive review of Krimighna drugs mentioned in the Ayurvedic Pharmacopoeia of India; International Journal of Ayurveda and Pharma Research; 2017; 5(6);66-79.
 13. Okram Mukherjee Singh and Thokchom Prasanta Singh; Phytochemistry of *Solanum xanthocarpum*: an amazing traditional healer, Journal of Scientific and Industrial Research; Vol 69; October 2010; 732-740.
 14. P. Chakraborty, A Textbook of Microbiology- 1st edition (1995); New Central Book Agency; Calcutta. pp.101-190.
 15. Roshy Joseph C, Ilanchezhian R, Patgiri BJ, Therapeutic potentials of Kantakari (*Solanum xanthocarpum* Schrad & Wendl.)-Ayurpharm International Journal of Ayurveda and Allied Sciences, Vol.1,No.2(2012) pages 46-53.
 16. Sachin parmar et al; *Solanum xanthocarpum* (Yellow Berried Nightshade):- A review, Scholars Research Library 2010,2(4):373-383.
 17. S. Gaherwal, G. Shiv and Nageshwar Wast; Antifungal Activity of *Solanum xanthocarpum* (Kantakari) Leaf extract; World Journal of Zoology; 9(2);111-114, 2014.
 18. S.J.Gupta and Manoj Kumar; Antibacteriurial effect of *Varunasigrughanavati* in Urinary tract infection-A clinical study Aryavaidyan Vol XXI, No 4, May-July 2008, Pages 240-244.
 19. S.V.Shintre et al; Standardization of Kantakari (*Solanum xanthocarpum* Schrad & Wendl) and Evaluation of its Antimicrobial activity in Lower Urinary Tract Infection (Mutrakruichhra); M.D (Ayu) dissertation; Maharashtra University of Health Sciences, Nashik, Maharashtra; 2018.

Cite this article as:

Shintre Sayali, Ramteke Ashok, Phadke Manju, Parab Vivek. Preliminary Antimicrobial Study of Kantakari (*Solanum Xanthocarpum* Schrad & Wendl) by Ditch Plate Technique. International Journal of Ayurveda and Pharma Research. 2019;7(5):23-27.

Source of support: Nil, Conflict of interest: None Declared

***Address for correspondence**

Dr Shintre Sayali

Assistant Professor,
Dept. of Dravyagunvigyan,
School of Ayurveda, Dr.D.Y.Patil
Deemed to be University, Nerul,
Navi Mumbai, Maharashtra, India.
Email: sayali.shintre@dypatil.edu
Cell: 9920533156.

Disclaimer: IJAPR is solely owned by Mahadev Publications - dedicated to publish quality research, while every effort has been taken to verify the accuracy of the content published in our Journal. IJAPR cannot accept any responsibility or liability for the articles content which are published. The views expressed in articles by our contributing authors are not necessarily those of IJAPR editor or editorial board members.