International Journal of Molecular and Clinical Microbiology 5(1) (2015) 523-527

International Journal of
Molecular and Clinical Microbiology

Evaluation of Antibacterial Effects of *Cinnamon* Extract and Essence on Bacteria Isolated from Patients with Urinary Tract Infection

Masoud Dadashi[1], Gita Eslami[2], Hossein Goudarzi[2], Fatemeh Fallah[3], Hossein Dabiri[2], Ali Hashemi[2], Najmeh Ardeshiri[4], Mohammad Javad Nasiri[1]

1Ph.D Student, Department of Microbiology,School of Medicine,Shahid Beheshti University of Medical Sciences,Tehran,Iran
2 Department of Microbiology,School of Medicine,Shahid Beheshti University of Medical Sciences,Tehran,Iran
3 Pediatric Infections Research Center,Mofid Hospital,Shahid Beheshti University of Medical Sciences,Tehran,Iran
4 Department of Microbiology, School of Medicine, Mazandaran University of Medical Sciences, Sari, Iran

ARTICLE INFO

Article history:
Received 4 January 2015
Accepted 7 May 2015
Available online 1 June 2015

Keywords:
Cinnamon, Antibacterial, Antibiotic sensitivity, Urinary Tract Infection.

ABSTRACT

With use of continuous prophylactic antibiotics in societies without any limitation, the number of drug resistant bacteria has been increased. This survey was aimed to evaluate the antimicrobial activity of Cinnamon extract and essence on bacteria that cause urinary tract infections (UTI), and compare it affects with common used antibiotics. This study was experimental design. Bacterial isolates i.e. *E.coli*, *Klebsiella pneumoniae, Staphylococcus aureus, Staphylococcus epidermidis, Streptococcus agalactiae* and *Enterococcus faecalis* were isolated from UTI. Antibacterial effects of Cinnamon against these bacteria then were analyzed according to the standard protocols. Antibacterial effects of antibiotic such as nalidixic acid and Co-trimoxazole were also evaluated by disc diffusion method. *Enterococcus faecalis*, *E.coli* and *Streptococcus agalactiae* showed 100% sensitivity for extract and essence. *Staphylococcus epidermidis* and *Staphylococcus aurus* (MRSA) had 80% sensitivity to extract and essence, and *Klebsiella pneumonie* had 90% sensitivity to extract and essence of Cinnamon. we conclude that essence and extract of Cinnamon have a much more effectiveness against bacteria isolated from UTI than common used antibiotics.

1. Introduction

Urinary tract infection is one of the most common infections in humans. It is more common in women than men which this difference is mostly due to anatomical sex differences (Fotuhi qazvini et al., 1992). Most cases of human urinary tract infections caused by *E. coli*. Other bacteria such as *Entrococcus*, *Proteus*, *Pseudomonas*, *Enterobacter*, and Staphylococcal are mainly response for secondary infections in urinary tract, because of secondary factors and hospital infections (Hacker et al., 1988). Plants with medicinal effects are important compounds of traditional medicine in virtually all cultures. Medicinal plants are having very great effect in the field of curing diseases and as an important source of medicines materials for a wide variety of human ailments (Iqbal Ahmad et al., 2001). Several research work and practical experience have shown that using plants with medical effects is better than a common antibiotic for treat the patient with different disease (Rafi khan Pathan et al., 2012). Herbal compounds have been used numerously fabulous source of a wide range of essential oils and nutrients required by the body, fresh fruits and edible plants and industrially

*Corresponding author: Dr. Masoud Dadashi
E-mail address: m_d6512@yahoo.com

processed juices, contain mostly flavanones and flavones (Kara pinar et al., 1985; Hammer et al., 1999). Cinnamon, which is dried, used as an anti-seizure in neurological diseases such as hysteria and neurasthenia and also is used to relieve hiccups. In addition to Cinnamon has a mild sedative effect, appetizer and fix palpitations (Zargari et al., 1375). In general microorganisms such as bacteria have the genetic ability to acquire resistance to many drugs, which are utilized as therapeutic agents (Tumane et al., 2014). The clinical efficiency of many antibiotics that use to treat the patients in existence is being treated by multi drug-resistant pathogen (Bandow et al., 2003). To overcome this problem of antibiotic resistance of bacteria, researchers concentrate their study to find and produce new drugs from plants with medicinal effects. Many infectious diseases treated with herbal remedies. The natural herbal products either as standardized plant extracts provided unbounded opportunities for new drugs leads because of the uncompared availability of different of chemical. This results to a urgent need to discover new antibacterial compounds with different structure and new mechanisms of action and treat for new-emerging, re-emerging and new infectious diseases (Eslami et al., 2013). This study was aimed to assess the antimicrobial effects of Cinnamon essence and extract on bacteria isolated from patients with urinary tract infection in compared with common used antibiotics.

2. Materials and methods

2.1. Plant Material

This experimental study was conducted From December 2014 to April 2015. The leaves of Cinnamon were collected from the local areas of Shiraz, Iran. The plant material was authenticated by the Department of Microbiology, Shahid Beheshti University of Medical Sciences.

2.2. Preparation of extracts

The dried and powdered peel materials (20 gr) were extracted with 200 ml of each solvent separately by using soxhlet extractor for 2 to 5 h at a temperature not exceeding the boiling point of the Solvent (Tumane et al., 2014). The solvents used for the study were Acetone. The extracts and essence were filtered and then concentrated to dryness. It were transferred to microtubes and kept at 4^{oC} before use. The extracts were dissolved in 2.5% aqueous dimethyl sulfoxide (DMSO) to produce a stock solution of 100 mg/ml (Tumane et al., 2014).

2.3. Screening for Antibacterial activity

2.3.1. Bacterial Isolates

The bacteria were isolated from urinary tract infected sample of patients. The antibacterial activities of Cinnamon extract were tested against *E.coli* and *Klebsiella pneumoniae, Staphylococcus aureus, Staphylococcus epidermidis, Streptococcus agalactiae* and *Enterococcus faecalis.* These isolates were kept in nutrient agar slant at 40^{o}C for further analysis. Urine samples were collected from 60 patients with UTI who were not taking antibiotics and then cultures were made on Blood agar, Mac conkey, Eosin methylene blue agar and Bile esculin agar. After appearing colonies of bacteria, gram staining was performed and was detected in the differential media.

2.3.2. Antimicrobial assay

Prime petri plates of sterile fused Mueller Hinton Agar (Hi-Media, Mumbai) at temperature of 40^{o}C and solidify the petri plates. After solidification 6 millimeter wells were primed. In these wells solvent extracts were increased. The plate was incubated overnight at temperature of 37^{o}C. After incubation the zones of growth inhibition were measured and recorded. These studies were done in triplicate. Antibacterial essence and extract were investigated on bacteria that isolated from 60 patients with urinary tract infection by agar disk diffusion method.

2.4. *Disc Diffusion Method*

Agar disc diffusion method was performed by soaking of blank discs in essence and extracts of Cinnamon and put them on Mueller Hinton agar medium. In this study was used of two antibiotics (Co-trimoxazole and nalidixic acid) to compare of antimicrobial effect of extract and essence of Cinnamon with commonly used antibiotics. Inhibition zone of antibiotic discs was compared with essence and extract of

Cinnamon and results were reported as susceptible, intermediate and resistant of bacteria to extract, essence and antibiotics.

3. Results

The results of this experimental study had shown that *Enterococcus faecalis* had 100% sensitivity to extract and Co-trimoxazole, and 80% against nalidixic acid. *E.coli* had 100% sensitivity against Co-trimoxazole, nalidixic acid, extract and essence. *Staphylococcus epidermidis* had 80% sensitivity to extract and essence, 75% sensitivity to nalidixic acid and 100% sensitivity to Co-trimoxazole. *Klebsiella pneumonie* had 80% sensitivity to Co-trimoxazole, 75% to nalidixic acid and 90% sensitivity to extract and essence of Cinnamon. *Streptococcus agalactiae* was 100% sensitivity to essence and Co-trimoxazole and 90% against nalidixic acid and shown 100% sensitivity against extract. *Staphylococcus aureus* MRSA shown 100% sensitivity against Co-trimoxazole and 80% sensitivity against essence, extract and 70% sensitivity to nalidixic acid. (Table 1 and Chart 1)

4. Discussion

The present study that was performed on 60 samples from patients with urinary tract infection, showed that essence and extract of Cinnamon has antibacterial activity against bacteria causing UTI infectious. In one study that performed by Amit Kumar et al. in India (Amit et al., 2012). Cinnamon oil were extracted to test the antibacterial activity on the five different bacteria which isolated from urine sample of UTI and the diameter zone of inhibition was measured. Results showed that Cinnamon oil had showed maximum activity against *Staphylococcus* with in comparison to gentamycin. Cinnamon oil had showed maximum results of antimicrobial activity against the organism's *Shigella* and *Pseudomonas* in comparison to norfloxacin. After that peppermint oil has showed almost equal results to the antibiotics with maximum activity against *E. coli* in comparison to norfloxacin and the Fennel oil. In another study in 2011 that performed by O. Al-Jiffri, antibacterial effect of Cinnamon had showed on *E. coli* and *Salmonella enteric* isolated from UTI (O. Al-Jiffri et al., 2011). Amalaradjou et al. (Amalaradjou et al., 2011) showed the ability of trans-cinnamaldehyde to inhibit UPEC biofilm formation of UPEC on catheters. In another study that conducted by Amalaradjou et al. in 2011 (Amalaradjou et al., 2010) demonstrated trans-cinnamaldehyde prevented the viulence factors of uroepithelial cells by down regulating genes in the pathogen. These results showed the trans-cinnamaldehyde can be use as an antibacterial for UTIs. Wendakoonan et al. (Wendakoon et al., 1995) demonstrated that other mechanism by which Cinnamon oil growth inhibit of microorganisms is by their antibacterial effect on amino acid decarboxylases enzymes. Smith-Palmer et al. (Smith-Palmer et al., 2002) in them study showed that Cinnamon is capable of inhibiting the production of virulence factors. Smith-Palmer and coworkers (Smith-Palmer et al., 2004) reported that Cinnamon decreased the production of enterotoxin A in *Staphylococcus aureus.* These results in comparison with our study with the same test organism and solvent shows that Cinnamon essence and extract showed relative similar results. Based on the results which obtained from several studies about the medicinal properties of Cinnamon, can be used of it as a pre-drug effective to reduce anxiety and inflammation in patients with urinary tract infections. Based on the antimicrobial effect of essence and extract of Cinnamon against *Streptococcus agalactiae* and *Enterococcus faecalis*, can be hoped to improve the patient with UTI by use the extracts and essence of Cinnamon besides effective drugs and can be used of it as an antibacterial agent in infections caused by these bacteria. According to this reality that extracts is taken from a plant with different methods and solvents can be Show the different antibacterial effects on a particular bacteria, we suggest to be investigated on other extracts and essences with different solvents and be measured the antibacterial effects of them. In addintion, since the *Enterococcus* is an important factor in the development of heart disease, digestive disease and tract-genital disease in patients, should be evaluate the antibacterial effect of extracts and essences of plant in vivo condition for treatment of these disease.

Conclusion

Extract and essence of Cinnamon had a greater effect on bacteria examined in this study. Based on these results, can be used of Cinnamon essence and extract as an adjunct to medication, also can be used in the treatment of urinary tract disease caused by gram-positive and negative bacteria that studied in this research.

Acknowledgements

Authors gratefully acknowledge from Dr.Eznollah Azargashb for his helpful comments in analyzation of data in this study.

Table1. Comparison between antibacterial activity of Cinnamon and common antibiotics against clinical isolates from UTI.

No. of Sr	Bacteria isolates from UTI	Cinnamon		Antibiotics	
		%Extract	%Essence	%Nalidixic acid	%Co-trimoxazole
1	*Streptococcus agalactiae*	100	100	90	100
2	*Staphylococcus aureus* MRSA	80	80	70	100
3	*Staphylococcus epidermidis*	80	80	75	100
4	*Enterococcus faecalis*	100	100	80	100
5	*E.coli*	100	100	100	100
6	*Klebsiella pneumoniae*	90	90	75	80

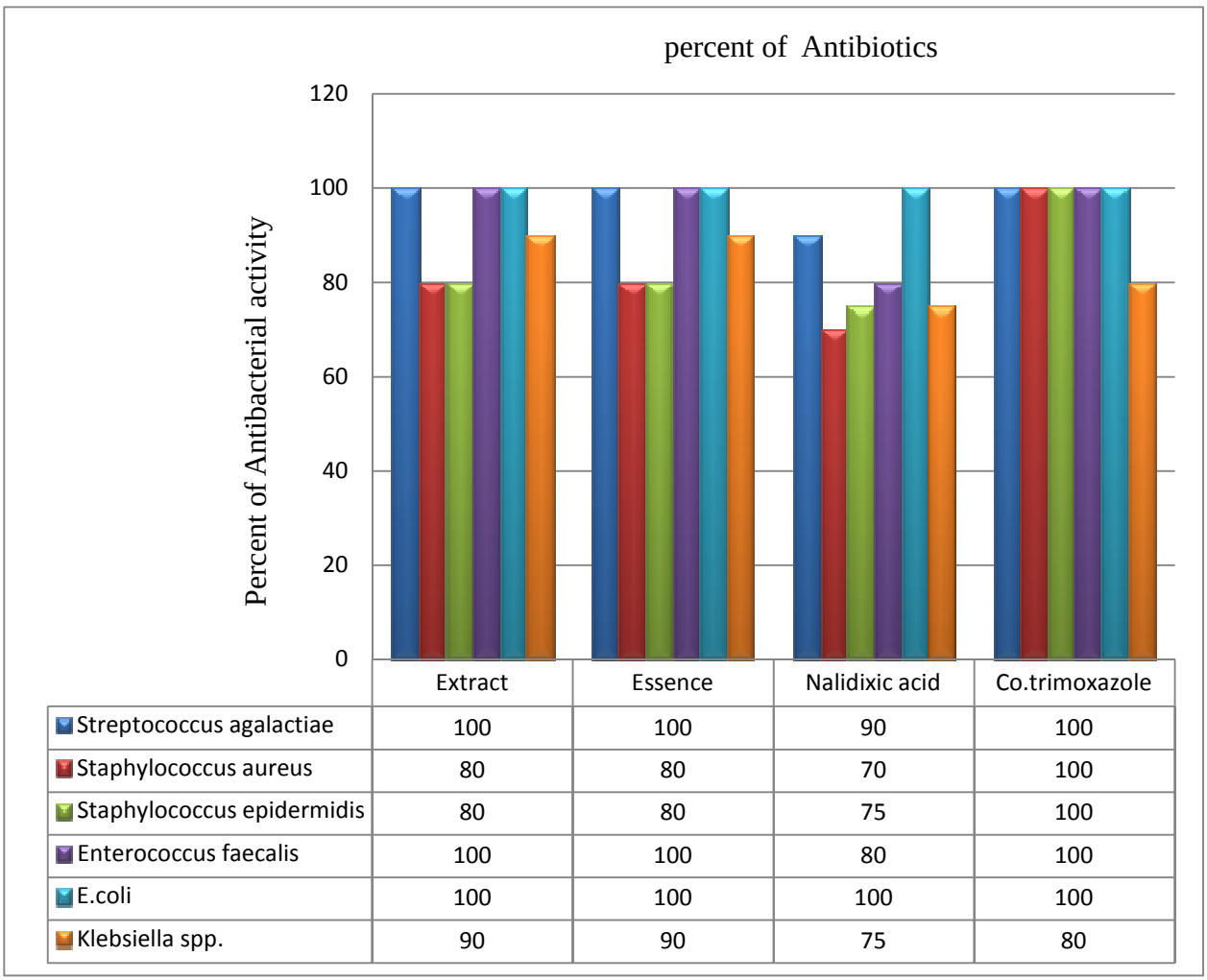

Chart1. Comparison between antibacterial activity of Cinnamon and common antibiotics against clinical isolates from UTI.

Refereces

Ahmad, I., Arina, Z. Beg., 2001. Antimicrobial and phytochemical studies on 45 Indian medicinal plants against multi-drug resistanthuman pathogens. Journal of Ethnopharmacology. 74; 113-123.

Amalaradjou, M.A.R., Narayanan, A., Baskaran, S.A., Venkitanarayanan, K., 2010.Antibiofilm effect of trans-cinnamaldehyde on uropathogenic Escherichia coli. J Urol. 184:358-363.

Amalaradjou, M.A.R., Narayanan, A., Venkitanarayanan, K., 2011. trans-Cinnamaldehyde decreases attachment and invasion of uropathogenic Escherichia coli in urinary tract epithelial cells by modulating virulence gene expression. J. Urol. 185:1526–1531.

Bandow, J.E., Brotz, H., Leichert, L.I.O., 2003. Proteomic approach to understanding antibiotic action. Antimicrobial agents Chemotherapy.47, 948-995

Eslami, G., Fallah, F., Taheri, S., Navidinia, M., Dabiri, H., Dadashi, M., et al .2013. Evaluation of antibacterial effect of cinnamon extract on Helicobacter pylori isolated from dyspeptic patients. Research in Medicine. 37(2): 85-89.

Fotuhi qazvini, R.,1992. Cultivation of citrus in iran. Gilan: Gilan Publication. P 105.

Hacker, J., Blum-Oehler, G., Köhler, G., Morschhäuser, J., Mühldorfer, I., Ziebuhr, W., 1998. Molecular analysis of infectious diseases: fungal and bacterial infections of the urinary tract. In: Nagataki I, editor. Proceedings of the Siebold Memorial International Medical Symposium. Nagasaki City, Japan: Nagasaki University Press. pp.129–143.

Hammer, K.A., Carson, C.F., Riley, T.V., 1999. Antimicrobial activity of essential oils and other plants extracts. J App Microbiol. 86:985-990.

Jiffri, O., Zahira, M.F., El-Sayed, and Fadwa, M., Al-Sharif., 2011. Urinary Tract Infection with Esherichia coli and Antibacterial Activity of Some Plants Extracts, International Journal of Microbiological Research. 2 (1): 01-07.

Kumar, A., Jhadwal, N., Lal, M., Singh, M., 2012. "Antibacterial activity of someMedicinal Plants used against UTI causingPathogens", Int. J. Drug Dev. & Res., April-June. 4(2): 278-283.

Kara pinar, M., et al., 1985.The effect of Citrus oil & some Turkish spices on growth and afla-toxin production by Aspergillus parasiti-cus NRRL 299. 12:239-2458.

Rafi khan Pathan et al., 2012. In vitro Antimicrobial Activity of Citrus aurantifolia and its Phytochemical screening Asian Paicfic Journal of Tropical Disease. S328-S331

Smith-Palmer, A., Stewartt, J., Fyfe, L., 2002. Inhibition of listeriolysin O and phosphatidylcholine-specific production in Listeria monocytogenes by subinhibitory concentrations of plant essential oils. J Med Microbiol. 51(7); 567-574.

Tumane, P.M, et al., 2014. Comparative study of antibacterial activity of peel extracts of Citrus auran tium L.(Bitter orange) and Citrus medical.(Lemon) against clinical isolates from wound infection.Int J Pharm Bio Sci Jan. 5(1): (P) 382 – 387

Wendakoon, et al., 1995. Inhibition of amino acid decarboxylase activityof Enterobacter aerogenes by active components in spices. J Food Prot. 58; 280- 283.

Zargari, A., et al., 1375. Medical plants. Tehran: Tehran University Publication. P 478 – 485.