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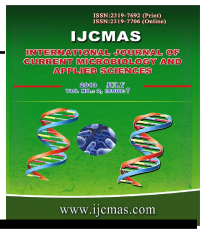

Original Research Article

Study of antibacterial effects of *Satureja essence* against some common nosocomial pathogenic bacteria

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Keywords

Disinfectant; Nosocomial pathogenic bacteria; Satureja essence.

A B S T R A C T

Nosocomial infections are one of the most problems in all health centers. For control of these bacteria, antibiotics, synthetic disinfectants and antiseptics are extensively use. Plant *essence*s has an active components that cleared has a widespread effects against these organisms without bacterial resistant. Thus, searching for finding natural antiseptic for nosocomial pathogens control may be specially interest. In this study, anti bacterial effects Satureja were investigated using antimicrobial analysis with NCCLS and Kirby bauer method. The agar dilution method results revealed the Satureja e had strong inhibitory effects against common nosocomial bacteria. The obtained results showed the antibacterial effect of Satureja *essence* purposes new disinfectants alternatives to control the nosocomial resistant bacteria. Additional studies and clinical trials are necessary to approve the use of these natural disinfectants in health care and pharmacopeia systems.

Introduction

Nosocomial infections are the most problematic issues in whole world. As usual, antibiotics, antiseptics and disinfectants have widely used for both prevention and control of these nococomial pathogens in health care facilities. However, antibiotics, commercial disinfectants and antiseptics may have penetrative, stimulating effects, expensive and not safe for human. In addition, bacterial resistance, bad smell and harmful paint seriously impair use of these materials (Sundheim *et al*., 1998; Amiri *et al*., 2011). In this respect, Organism resistances that may be results of same active substance in disinfectants are the most challenges (Amiri *et al*., 2011). Because of the above-mentioned facts which led to the ban on antiseptics and disinfectants in around the world,

there is a demand for discovering new materials that can inhibit opportunistic pathogen growth (Ariana *et al*., 2011). In recent years, antiviral, antibacterial and antifungal effects have been reported for different plant extracts in different parts of the world. Their curative effect has been known since antiquity. It is based on a variety of pharmacological properties which are specific for each plant species Therefore; essential oils and plant extracts are used in the pharmaceutical industry as active ingredients or constituents of drugs, soaps, shampoos, perfumes and cosmetics (Oussalah *et al.*, 2007). Beneficial activity of such extract is related to the content of various secondary metabolites such as polyphenols, carotenoids, triterpenes and essential oils. In the meantime, *Satureja* is well known aromatic and medicinal plant, which is widely distributed in the The Middle East region and IRAN (Deans and Svoboda,1989). *Satureja* has been also used as folk remedies to treat various ailments such as cramps, muscle pains, nausea, indigestion, diarrhea, and infectious diseases as well has a good fragrance (Deans and Svoboda,1989). It has showed antispasmodic, antidiarrhoeal, antioxidant, sedative as well as and antimicrobial properties (Deans and Svoboda,1989; Sahin *et al*., 2003). However, previous suggested that *Satureja* antibacterial affects could be attributed to the content of carvacrol (2-methyl-5-(1-methylethyl) phenol) which are known for their wide spectrum of antimicrobial activity, which has been the subject of several investigations *in vitro* (Dorman and Deans, 2000; Lambert *et al*., 2001) and *in vivo* (Manohar *et al*., 2001; Nostro *et al*., 2007). Based on above mention, the present study was aimed to investigate the inhibitory effect of *Satureja* extract on growth of some nosocomial pathogens bacteria.

Materials and Methods

Plant material and extraction procedure

The aerial parts of the Satureja Khuzestanica plant were collected during the flowering stage in June 2000 from Khoramabad in the Lorestan province of Iran. The plant was identified by the Department of Botany of the Research Institute of Forests and Rangelands (TARI) in Tehran. A voucher specimen (No. 58416) has been deposited at the TARI Herbarium. The plant was cultivated in Khoramabad and the aerial parts of the plant were collected during the flowering stage. The aerial parts were air dried at ambient temperature in the shade and hydrodistilled using a Clevenger type apparatus for 5 h, giving yellow oil in a 0.9% yield. The oils were dried over anhydrous sodium sulfate and stored at 4°C.

Study was an experimental type and conducted according to the NCCLS 2OO4 standards and instructions and does not need statistical analysis7. The following standard species used in this study are obtained from Iran's Industrial and scientific research center. S. aureus PTCC 1169, Enterococococcus fecalis PTCC 1447, Propionibacterium acne ATCC 11828, Bacilus cereus PTCC 1023, Pseudomonas aeruginosa ATCC 27853 and Klebsiella pneumonia PTCC 1053. After a 24h later the antimicrobial effects of non-growth diffusion zone was measured to confirm the results. The bactericidal effect of the essence could be confirmed if there was no detectable bacterial growth. To validate the results, some samples using Fyldo platyn rod, were picked up from the non-growth diffusion zone and were cultured in a sterile environment. Consequently, antimicrobial effectiveness of the

bactericide would be confirmed if there was no detectable bacterial growth in the disc diffusion zone (Tables 1). At the end, the minimum inhibitory concentration (MIC) of each disinfectant was determined through experiments by measuring the non-growth zone diameter according to the diffusion method.

Result and Discussion

Antimicrobial Assay

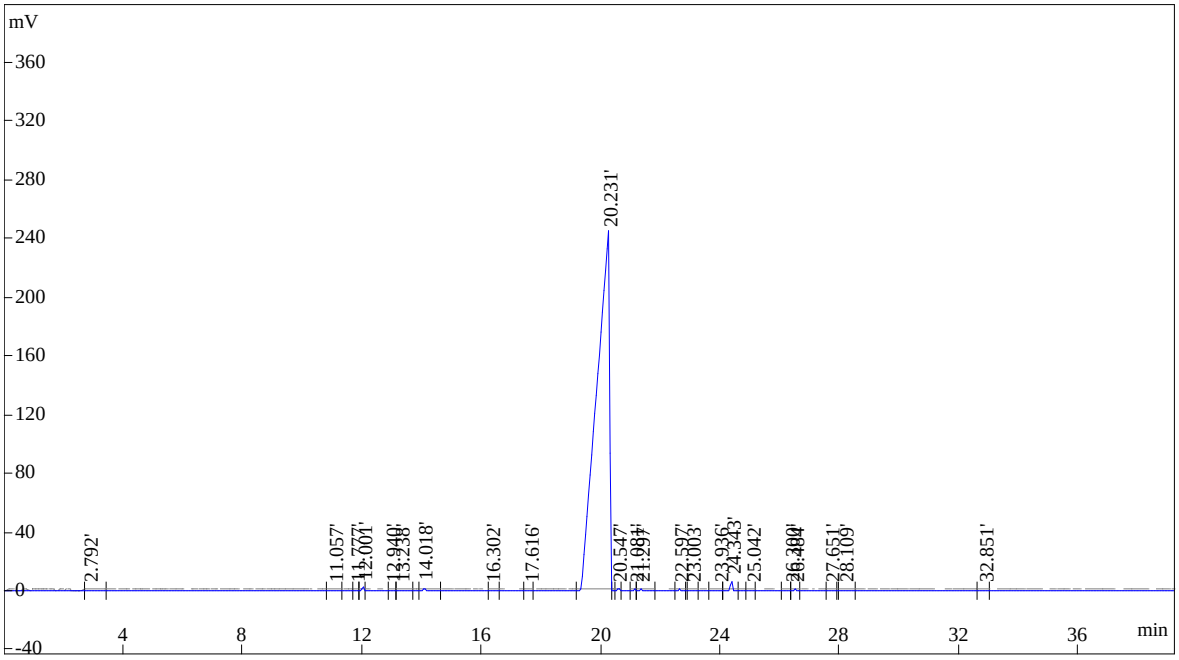
The antimicrobial effect of Satureja extract on the nosocomial infections bacteria was detectable (Table.1). There are problems with current antibacterial treatments against *bacteria* such as multidrug resistance, high expenses, drug interventions, poor satisfaction, side effects and their impact on the normal intestinal flora[6] which together highlight the need for alternative therapeutic methods such as traditional medicine(Nostro *et al*., 2007; Burt, 2004; Kordali *et al*., 2005; Sylvestre *et al*., 2006; Faid *et al*., 1995)..

Penicillium ochlochloron and *Penicillium funiculosum* have been proven as the most active fungi against this microorganism (MIC 3.9 mg ml-1) (Stamatis *et al*., 2005). Our findings through this research significantly indicate satureja essence as a potential lead compound of a novel class of *nosocomial pathogen* inhibitors where it shows a very high gram positive and gram negative effect. More ever, it is not toxic, and is widely available as a low price traditional drug compound.

Table.1 Antibacterial activity of the Satureja essence based on dilution method

Bacterial Species	**Gram reaction**	**non-growth Zone diameter(cm)**	**MIC**
Staphylococcus aureus PTCC 1169	+	5	5
Enterococococcus fecalis PTCC 1447	+	5.5	5.5
Propionibacterium acne ATCC 11828	+	7	7
Bacilus cereus PTCC 1023	+	4	4
Pseudomonas aeruginosa ATCC 27853	-	4.5	4.5
Klebsiella pneumonia PTCC 1053	-	5.5	5.5
Values are the mean diameter of inhibitory zones (cm).			

Figure.1. GC Report of Carvacrol



Rank	Time	Name	Area%	Area
1	2.792		0.04081	3087
2	11.057		0.06799	5144
3	11.777		0.03982	3013
4	12.001		0.2111	15973
5	12.940		0.07064	5344
6	13.238		0.03678	2783
7	14.018		0.207	15664
8	16.302		0.07865	5950
9	17.616		0.07583	5737
10	**20.231**		**97.89**	**7406146**
11	20.547		0.07025	5315
12	21.081		0.07232	5471
13	21.297		0.08472	6409
14	22.597		0.09271	7014
15	23.003		0.04889	3699
16	23.936		0.02936	2221
17	24.343		0.4931	37304
18	25.042		0.05783	4375
19	26.300		0.09026	6829
20	26.484		0.06975	5277
21	27.651		0.03047	2305
22	28.109		0.07307	5528
23	32.851		0.06149	4652
Total			100	7565240

STEM: Beifen 3420 capillary gas chromatographs Y
Column: BP-5 (5%phenyl:95% polydimethyl siloxane) fused silica capillary column (30m*0.2 5mm Internal diameter, 0.25µm film thickness)
Kind of gas: Helium with purification 99.999%

Many studies have investigated the antibacterial activity of essential oils from *T. vulgaris* and *E. globulus* against different pathogens (Cimanga *et al.*, 2002).

Their antimicrobial activity is mainly attributed to the presence of some active constituents in their EOs together with their hydrophobicity which enables them for rupturing cell membranes and intrastructures (Sikkema et al., 1994). In this study, satureja essence were used to assess their antibacterial activity against *important pathogens* by inserting some minor changes to the NCCLS recommended agar dilution method that have been originally developed for analyzing the conventional antimicrobial agents activity, so it could be used to analyze plant extracts and essential oils for their antimicrobial activity (Hammer et al., 1999: Van de Braak SAAJ and Leijten,1999; Milhau *et al*., 1997; Al-Shuneigat *et al*., 2005; Horne *et al*., 2001; Calamari *et al*., 2003; NCCLs, 2003; Esmaeili *et al*., 2003). In this study using satureja essence against these pathogens resulted in these which can be effective enough to reduce the rate of infection transmission.

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