Antibacterial Activity of Rosemary (Rosmarinus officinalis L.) Essential Oil Belong to the Zagros Region

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ABSTRACT

Background: Rosemary (Rosmarinus officinalis L.) is an important medicinal plant grown in many parts of the world with many uses. It is one of the most appreciated sources for natural bioactive compounds which are of special interest in the functional food industry. Objective: The aim of this paper was measurement of antibacterial activity of rosemary essential oil against four bacteria. So, Plant samples were dried in shade and room temperature for ten days. Then extracted for 3 h using a Clevenger-type apparatus. After that, antibacterial activity determined with disc diffusion method. Results: Results of the antibacterial activity in vitro indicated that the essential oils from rosemary have good inhibitory activities against all bacteria, especially against E. coli.

INTRODUCTION

Herbs, spices, and essential oils are well known for their various beneficial effects on human health. The use of herbs in phytotherapy is mostly due to the essential oils and their various biological activities, such as spasmylytic, carminative, hepatoprotective, antiviral, and anti-carcinogenic properties (Bajalan and Ghasemi Pirbalouti, 2014).

Rosmarinus officinalis L. commonly referred as rosemary belongs to Lamiaceae family of Mediterranean origin. It is an evergreen branched and bushy shrub and is a popular herb and spice. Because of its essential oil and phenol biological properties, R. officinalis L. is the most used aromatic and medicinal plant worldwide (Rozman and Jersék, 2009). Rosemary is also used in the cosmetics and medicine. In folks medicine rosemary has been used as an analgesic, anti-rheumatic, carminative, diuretic, expectorant, and antiepileptic, for effects on human fertility and as hepatoprotectant (Al-Sereiti et al., 1999; Zegura et al., 2011). The extract of R. officinalis L. has been shown to have cancer preventive properties (Singletary and Nelshoppen, 1991; Huang et al., 1994) as well as anti-oxidative stress properties (Horvathova et al., 2010).

Biological activity of R. officinalis and its Chemical component in many researches have been evaluated. According to Moreno et al. (2006), Rosemary essential oil from wild populations exhibits high variation in its antimicrobial and antioxidant activities. These disparities are associated with the varying chemical composition of the essential oils. Factors including place of origin (Jamshidi et al., 2009), environmental and agronomic conditions (Moghtader and Afzali, 2009), effect of bioclimatic area (Jordán et al., 2013) and the time of harvest (Celiktas et al., 2007) influence the effectiveness of these properties.

The objective of the present study was to evaluate the antibacterial actively of rosemary essential oil against four bacteria.

1. Methodology:

The areal parts of plant samples were harvest in Borujerd area, Western Iran in June 2013. Sample was labeled and the location was recorded using a Global Positioning System (GPS, Vista Garmin) receiver (48°39’38.62”E, 33°54’58.79”N and Altitude 1896 m).
Fresh leaves were dried for 10 days at room temperature (25°C). 100 g of the powdered tissue was distilled for 3 h using a Clevenger-type apparatus. The collected essential oil was dried over anhydrous sodium sulphate and stored at 4°C. The yield based on dry weight of the sample was calculated.

Clinical isolates of bacteria strains obtained from Borujerd University, Iran. The antibacterial activity of the essential oils against Streptococcus agalactiae (ATCC 12386), Escherichia coli (ATCC 8739), Staphylococcus aureus (ATCC 33591), and Klebsiella pneumoniae (ATCC 700603) bacteria were determined with the disc diffusion method (NCCLS, 2002). Briefly, bacterial suspensions were adjusted to 1×10^7 CFU/ml and spread in TSA or PCA using sterile cotton swabs. Subsequently, filter paper discs (6 mm Ø; Whatman #1) were placed on the surface of Petri dishes and impregnated with 20 µl of essential oil. Negative controls were prepared with DMSO. After staying at 4 °C (2 h), all Petri dishes were incubated at 30 °C (24 h). All determinations were performed in triplicate. Antibacterial activity was evaluated by measuring the radius of the inhibition zones to the nearest millimeter (Teixeira et al., 2013).

3. Results:

The essential oil yield was 1.9 ml/100 g. The results of comparing the average of data showed that the most inhibition zone belongs to E. coli bacteria. The least inhibition zone belongs to negative control of DMSO (figure 1). The investigations in this research showed that the essential oil of rosemary has antibacterial characteristics against the bacteria presented in this research. Moreno et al. (2006) reported that rosemary plants are rich sources of phenolic compounds with high antimicrobial activity against both Gram-positive and Gram-negative bacteria. Ouattara (1997) investigated the antibacterial activity of selected essential oils against some food spoilage organisms. They concluded that the essential oils of cinnamon, clove and rosemary were the most active. Similar results were obtained by Valero and Salmeron (2003) for the antibacterial activity of rosemary essential oil against Bacillus cereus strains grown in carrot broth.

![Fig. 1: The inhibition zones of four bacteria in the presence of rosemary essential oils and control.](image)

It is becoming increasingly difficult to ignore the biological activity of rosemary. Essential oil of rosemary has antibacterial characteristics and considering this characteristic we can make medicine with natural resources. Also by doing more researches about this, it will be possible to identify the most important compositions in the rosemary essential oil that has the most antibacterial characteristics. More information regards this, needs more studies.

4. Discussion and Conclusion:

Here, we describe the antimicrobial activity of rosemary Essential oil against S. agalactiae, E. coli, S. aureus, and K. pneumoniae. The result of this study was in agreement with other studies about antibacterial activity of rosemary. In study of Rozman et al., (2009) the effect of rosemary extract on different types of listeria was studied. Another study (Genena et al., 2008) showed the effects of rosemary essential oil on Gram-positive Staphylococcus aureus and Bacillus cereus and reported that the effect is higher on Gram-positive bacteria than on Pseudomonas aeruginosa and Escherichia coli. According to this study, essential oil of rosemary can inhibit the growth of bacteria. Therefore it can be used as a potential antimicrobial agent of natural origin in foods.
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REFERENCES


