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RESEARCH OPINIONS IN ANIMAL & VETERINARY SCIENCES

Antibacterial activity of *Myrtus communis* L. and *Zingiber officinale* rose extracts against some Gram positive pathogens

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Abstract

Use of medicinal plant extract against bacteria could reduce the use of antibiotics. One of these herbs is *Zingiber officinale* rose and the other one is *Myrtus communis* that have been reported in this paper. In this study, we tried to show application of *Myrtus communis* L and dry and fresh *Zingiber officinale* rose (alcoholic extracts) on growth inhibition of some bacteria. Microorganisms used in this study were selected according to their pathogenicity including *Staphylococcus aureus* (ATCC 25923), *Bacillus cereus* (ATCC 10876 & NCTC 7464) and *Listeria monocytogenes.* Alcoholic extract of *Myrtus communis* and *Zingiber officinale* rose were prepared and concentrated up to 70% of initial weight. The fresh *Zingiber officinale* rose extract had the most restrains effect (attended to minimal restrain) for 42.6 milligrams of *Listeria* with the percentage of 9.1 millimeters of corona. There is no any restraining effect of fresh *Zingiber officinale* rose on these bacteria. For *Staphylococcus aureus* and *Listeria monocytogenes*, the *Myrtus communis* herb had a more restraining effect than fresh *Zingiber officinale* rose. In conclusion, ginger extract can effectively kill pathogenic bacteria.

Keywords: Antibacterial; *Myrtus communis*; *Zingiber officinale* rose; pathogenic bacteria

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Introduction

Natural medicine and herbs have long been the basis, or even in some cases, the only way of treating diseases. Currently pharmacological industries use many kinds of herbs as the basis of their products (Velag and Stodo, 1991). Early 20th century is characterized by great achievements in chemistry and discovery of the complicated systems of biosynthesis, which led to development of pharmacology industry and replacement of many herbal-based medicines with new ones. However, new chemical medicines and antibiotics were not free of negative side effects so that several disease-causing bacteria developed resistance against antibiotics since the 1950s; a trend which is still ongoing (Zargari, 1987; Mir haidari, 1993). Thus, attentions were drawn toward using herbs to find new combinations to fight against resistance developed by bacteria. This paper, among such herbs, focuses on ginger and Myrtaceae.

Ginger is an herbaceous permanent plant, which reaches 2m high, and it is usually found in grassland of humid regions as a weedy plant. It has long meaty roots with straight stem that grows into several branches (Zargari, 1987). Leaves at the lower parts of the stem are oval-shaped with petiole, while the leave on the stem are needle-shaped and without petiole. The fruit of the plant is achene with crown (Amin, 2005). Ginger available in market is in form of thick woody pieces, relatively stretched, branched and broad with yellowish

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white leave with very strong taste and smell. This product is obtained from rhizome of the Ginger (*Zingiber officinale* rose from Zingiberaceae family). The root of the plant is rich in inulin, alantolucton, anti-spasm and essential oils (Al-Amin et al., 2006).

Myrtaceae (*Myrtus communis*-Myrtaceae family) is a small and evergreen shrub with height of 1-3m; leaves are permanent, reciprocal, plane, pointy, leather surface and odorous. Its flowers are relatively large, white in colour with special odour; the fruit is berry, bluish black and rarely white with resin and acrid taste. The species is native of south and north of Iran and can be found wherever olive and eucalyptus can grow (Zargari, 1987; Manniche, 1989). The leaves contain glycosides and Arbutine, tannin, organic acids, glucose, vitamin C, herbal antibiotics and camphene (Amin, 2005).

Myrtaceae has anti-infectious effects, lessens inflammation of urinary ducts and gallstone, pain, stomach pain, inflammation, cough, mucus and chest phlegm and some cutaneous conditions (Lefkowitz and Fant, 1977). Soranus (the Greek physician of 1st and 2nd centuries) used green Myrtaceae as contraceptive drug (Riddle, 1994). The Roman physician Galen (129-2000 AC) used a combination of Myrtaceae flower, Juniper, mulberry and wine to treat diarrhea. Byzantine the Turkish physicist of 6th century used Myrtaceae to stop bleeding (Baumann, 1993). Alimentorum Faculatibus discussed dynamics effects of different foods and stated that Myrtaceae has hot and strong effects (Baumann, 1993). Dioscorides, a Greek pharmacologist (40-90AC) used Myrtaceae in Turkey to treat the respiratory problems caused by scorpion and other insects bite (Gunther, 1959; Nascimento et al., 2000). They further explained that the herb is effective on lessening menstrual and intestinal problems.

Materials and Methods

Microbial strain

Gram positive bacteria *Staphylococcus aureus* (ATCC 25923), *Bacillus cereus* (ATCC 10876 and NCTC 7464) and *Listeria monocytogenes* were used in the study. Bacterial strains were cultured in a rich culture environment (Peptone 2%, NaCl 0.5%, Na_2HPO_4 4%, and 50ml of sheep liver extract) at 37°C in aerobic condition over night before the test.

Plant extract

Myrtaceae 70% extract and fresh and dried ginger in alcohol 90% were prepared through mixing grinded dried ginger and Myrtaceae and then added in sufficient quantity to alcohol 90% and then left in water at 37°C for 3hrs, to obtain the extract.

Antibacterial effect of plant extract through agar infusion

Microbial suspension of the microorganisms under study was prepared separately. Determination of bacterial population in suspension was carried out by turbidimetry method (serial dilution) and the table of McFarland standards. Afterward, 100ml of each suspension were surface cultured in agar Peptone (Peptone 2%, NaCl 0.5%, agar agar 2%, Na_2HPO_4 4% and 50ml of sheep liver extract) so that sterile paper discs of 4, 6, 8, 10, and 12ml of Myrtaceae and 14.2, 21.3, 28.4, 35.5, 42.6 mg of ginger were placed on the culture environment separately. Alcohol 90% was used as negative control group, which was incubated at aerobic condition for 48hrs and the diameter of inhabitation zone was recorded in millimeter (Saeedi et al., 2012).

Results

Regardless of the kind of bacterium, surveys of the effect of the extract used in the microorganisms showed that the Myrtaceae and ginger extract had the maximum and minimum effects respectively. Results of the effect of the extracts on the Gram positive bacteria are as follows:

Dried ginger: as the data and the diagrams regarding the inhabitation effect of the extract on the bacteria (12mm min) reveals, the effect of ginger on *Staphylococcus aureus* and *Listeria monocytogenes* was maximum and minimum respectively. In addition, the most effective amount of dried ginger is 42.6 mg punch. At this dose, zone of 15.8mm was obtained for *Staphylococcus aureus* and *Bacillus cereus* (Fig. 1a&b).

Fresh ginger: comparing with minimum growth inhabitation effect, this extract had the best effect on Listeria at 42.6mg with zone diameter of 9.1mm (Fig. 2a&b).

Myrtaceae: the herb showed growth inhabitation effect on the three examined bacteria even at concentration of 10mg. Maximum and minimum effects were observed on *Staphylococcus aureus* and *Bacillus cereus* respectively (Fig. 3 a&b).

Discussion

It is long that we know about preventive effects of herbal essences; however, it is only in the recent years that the effect of odorous extracts and herbal essences (or their officinal elements) on pathogens and microorganisms causing spoilage of food stuff have received considerable attention (Imaida et al., 1983, Blackburn and McClure, 2002 and Vernozy-Rozand et al., 2002). Several studies have found that anti-microbial effects of herbal extract are subject to dosage dose (Sa□dıç, 2003; Burt, 2004) as found by the present study. The highest and lowest growth inhabitation effects of dried ginger were found on *Staphylococcus aureus* and *Listeria monocytogenes* respectively. The best results were obtained for the dried ginger at 42.6 mg punch with

Fig. 1a: Effect of dried ginger extract on *Staphylococcus aureus, Bacillus cereus* and *Listeria monocytogenes*

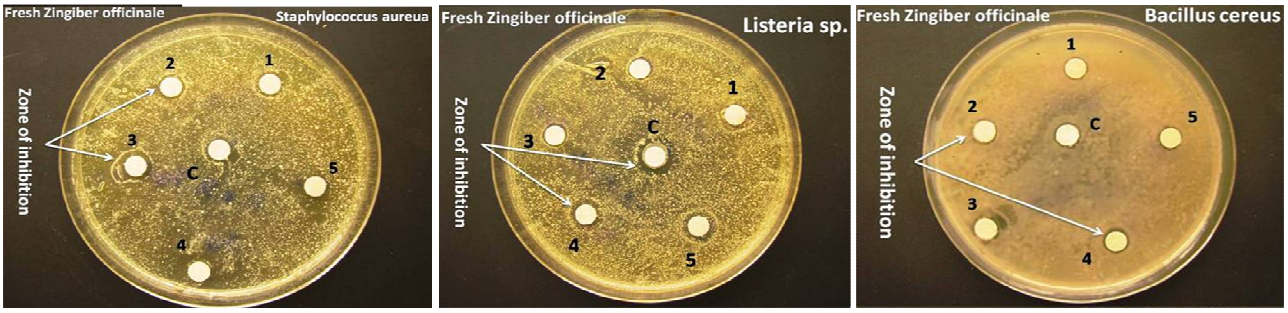

Fig. 2a: Effect of fresh ginger extract on *Staphylococcus aureus, Bacillus cereus* and *Listeria monocytogenes*

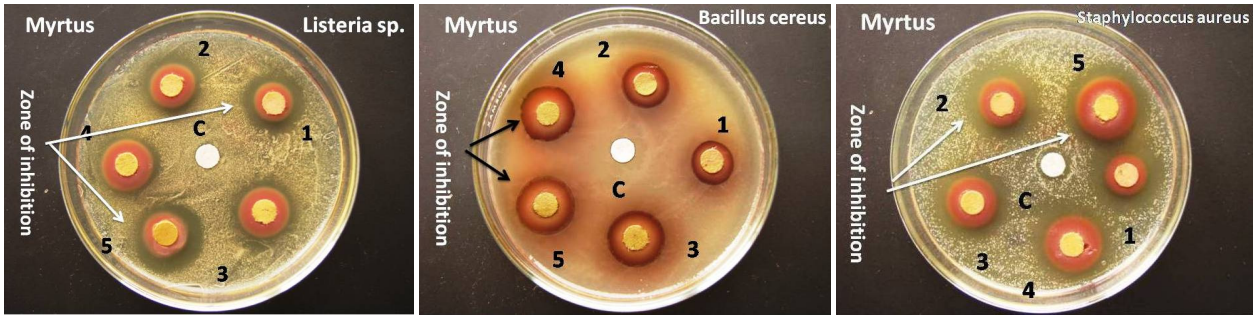

Fig. 3a: Effect of Myrtaceae: extract on *Staphylococcus aureus*, *Bacillus cereus* and *Listeria monocytogenes*

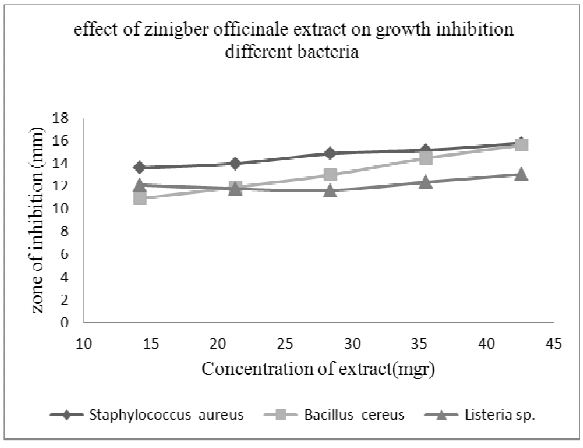

Fig. 1b: Effect of dried ginger extract on *Staphylococcus aureus, Bacillus cereus* and *Listeria monocytogenes*

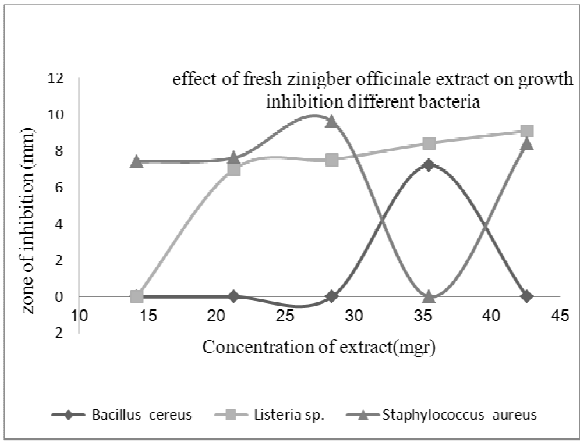

Fig. 2b: Effect of fresh ginger extract on *Staphylococcus aureus, Bacillus cereus* and *Listeria monocytogenes*

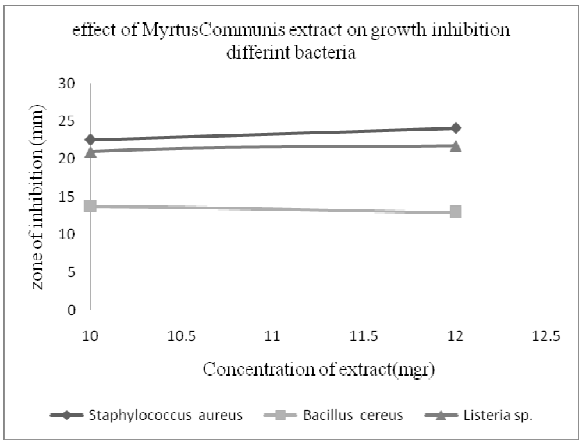

Fig 3b: Effect of Myrtaceae extracts on *Staphylococcus aureus*, *Bacillus cereus* and *Listeria monocytogenes*

the zone of 15.8 millimeter on *Staphylococcus aureus* and *Listeria monocytogenes*. Comparison of the results of extract of ginger in alcohol with those of other studies shows the anti-bacterial and growth inhabitation effect of ginger (Zamanzad, 2010). Chen et al. (1985) studied the effect of ginger on *E.coli, Salmonella typhimurium, Vibrio Parahaemolyticus, Pseudomonas aeruginosa, Proteus vulgaris, Staphylococcus aureus, Mycobacterium fleie, Streptococcus faecalis, Bacillus cereus,* and *Micrococcus luteus.* They found that ginger showed growth inhabitation effect only on *Micrococcus luteus*. Myrtaceae showed growth inhabitation effects on the three kinds of bacteria only at concentration below 10mg; which is consistent with previous results (Saeedi et al., 2012). The highest and lowest growth inhabitation effects of Myrtaceae were found on *Staphylococcus aureus* and *Bacillus cereus* respectively. Taking into consideration that in comparison with 0.6% polyphenol in ginger, Myrtaceae extract contains 2.3% of polyphenol and that the both have equal level of glucose, more effectiveness of the later is justifiable. Given these results, the combinations of ginger and Myrtaceae extracts can be used in lotions prescribed for common infections found among victims of accidents.

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