In-vitro Antibacterial Activity of Zataria multiflora Boiss Against Bacillus subtilis and Staphylococcus aureus

Balkanian F*, Darabia Sh, Ahmadi R, Moradikyia A, and Mahdavi E

I. INTRODUCTION

Bacillus is a genus of Gram-positive, rod-shaped bacteria and a member of the phylum Firmicutes. Bacillus species can be obligate aerobes or facultative aerobes. They will test positive for the enzyme catalase when there has been oxygen used or present [1]. Ubiquitous in nature, Bacillus includes both free-living (non-parasitic) and parasitic pathogenic species. Under stressful environmental conditions, the bacteria can produce oval endospores that can stay dormant for extended periods. These characteristics originally defined the genus, but not all such species are closely related, and many have been moved to other genera of Firmicutes [2].

Staphylococcus aureus is a bacterium that is a member of the Firmicutes, and is frequently found in the human respiratory tract and on the skin. Although S. aureus is not always pathogenic, it is a common cause of skin infections (e.g. boils), respiratory disease (e.g. sinusitis), and food poisoning. Disease-associated strains often promote infections by producing potent protein toxins, and expressing cell-surface proteins that bind and inactivate antibodies. The emergence of antibiotic-resistant forms of pathogenic S. aureus (e.g. MRSA) is a worldwide problem in clinical medicine [3]. S. aureus is responsible for many infections but it may also occur as a commensal. The presence of S. aureus does not always indicate infection. S. aureus can survive from hours to weeks, or even months, on dry environmental surfaces, depending on strain [4]. S. aureus is extremely prevalent in atopic dermatitis patients. It is mostly found in fertile, active places, including the armpits, hair, and scalp. Large pimpls that appear in those areas may exacerbate the infection if lacerated. This can lead to staphylococcal scalded skin syndrome (SSSS). A severe form of this, Ritter's disease, can be observed in neonates [5]. Its essence is a liquid yellow or purple, smell and spicy taste is exquisite. Phenolic compounds thymol and it is the most effective substance. Another important compound carvacrol that dissolve well in alcohol and organic solvents, and the materials are stored mainly in young leaves during plant growth. An infusion of the leaves is used to relieve cough. Antiseptic alcohol extract that is painful and confusing [6].

Researchers have found that Zataria multiflora Boiss extract is active against herpes simplex 1 [7]. In another study, researchers showed that the herb thyme is an anticonvulsant that dissolve well in alcohol and organic solvents, and the materials are stored mainly in young leaves during plant growth. An infusion of the leaves is used to relieve cough. Antiseptic alcohol extract that is painful and confusing [6].

II. MATERIAL AND METHODS

Adult male Wistar rats weighting 200±30g were purchased and raised in our colony from an original stock of Pasteur institute (Tehran, Iran). The temperature was at 23±2 °C and animals kept under a schedule of 12h light: 12h darkness with free access to water and standard laboratory chow.

The plant materials used in this study consisted of Zataria multiflora Boiss extract. The fully dried plant materials were ground into fine powder, and stored in a sterile glass bottle at room temperature. 20% ethanolic solution of the extracts were prepared and used in our study.

Farzaneh Balkanyan (MSc student) (*corresponding author) is with Department of Microbiology, Faculty of Science, Islamic Azad University, Qom Branch, Qom, Iran (email: fbalkanyan.2014@gmail.com).
Shiva Darabia (MSc) is with Department of Microbiology, Faculty of Basic Sciences, Islamic Azad University, Pishva Branch, Varamin, Iran (e-mail: Darabi_shiva@yahoo.com).
Rahim Ahmadi (PhD) is with the Department of Physiology, Faculty of Basic Sciences, Islamic Azad University, Hamedan Branch, Hamedan, Iran. (e-mail: Rahimahmadi20122@yahoo.com).
Abdullah Moridikia (MSc student), Science Biology Research Center, Imam Hussein University, Tehran, Iran (Email: abmoridikia@yahoo.com).
Edris Mahdavi is with Department of Horticulture, Faculty of Agriculture, Islamic Azad University, Karaj Branch, Karaj, Iran (e-mail: Edris.mahdavi@yahoo.com).
Antibacterial activity was determined by agar well diffusion method. Sterile Mueller-Hinton agar plates (30 ml per plate) were prepared. Three wells (each of 6 mm diameter) were bored on the surface of the agar media on each plate. 20 μl of each extract was dropped into each appropriately labeled well. Tetracycline (20 μg/disc) was used as the control. The inoculated plates were allowed to stand at room temperature for 45 min to allow the diffusion of the extracts into the agar to proceed before growth of the organism commenced. The plates were incubated at 35°C for 24 h. The assessment of antibacterial activity was based on measurement of the zone diameter of the inhibition (ZDI) formed around the well. The ZDI of extracts were compared to tetracycline zone diameter of the inhibition.

III. RESULTS

The extracts showed antibacterial activity against Bacillus subtilis and Staphylococcus aureus zone diameter of the inhibition of Zataria multiflora Boiss was less than the zone diameter of the inhibition of tetracycline. The antibacterial activity of extracts was more against Bacillus subtilis than Staphylococcus aureus.

IV. DISCUSSION

The results of current research show that hydroalcoholic solution of Zataria multiflora Boiss extract has antibacterial activity against Bacillus subtilis and Staphylococcus aureus. In accordance with our findings, there are other studies showing that some other plant extracts have antibacterial activities. One study showed that the herb marshmallow and chamomile have anti-microbial properties [12]. In another study it was observed that the horse tail herb is also antibacterial [13]. The results of another study also have shown the antimicrobial properties of mint leaves [14]. In another trial the researchers concluded that garlic extract has an antimicrobial effect on Staphylococcus aureus and bacillus subtilis [15], [16]. Other research results suggest that the plant extract Hfairyqvn very good inhibitory effect against methicillin-resistant strains of Staphylococcus aureus [17].

Zataria multiflora Boiss. with the common Persian name “Avishan-e Shirazi” is a thyme-like essential oil (EO)-bearing plant that belongs to the Lamiaceae family and grows extensively wild in the central and southern parts of Iran, Pakistan, and Afghanistan. In Iran, Z. multiflora mainly used in traditional folk remedies for its antiseptic, analgesic, and carminative (anti-flatulence and intestine-soothing) properties [18]. The studies have shown that the main constituents of the dry plant are thymol, carvacrol, while the main constituents of the fresh plant are thymol, carvacrol, p-cymene, linalool and gamma-terpinene [19]. The antibacterial effects of the plant can also be attributed to carvacrol [18].

V. CONCLUSION

We have shown that Zataria multiflora Boiss extract has antibacterial activity against Bacillus subtilis and Staphylococcus aureus. The results indicate the antibacterial use of the studied plants for the treatment of Bacillus subtilis and Staphylococcus aureus infection.

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REFERENCES