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Antibacterial Activity of Aqueous Extracts of *Artemisia* species against some Pathogenic Bacteria

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The present study was lead with a view to evaluate the antibacterial potentials of aqueous extracts of Artemisia species against human pathogenic bacteria: Escherichia coli (E.coli), Pseudomonas aeruginosa (Ps. aeruginosa) , Staphylococcus aureus (Staph. aureus) and Enterococcus faecalis (Entero. faecalis) by two methods, first method was minimum inhibitory concentration (abbreviation: MIC) and sound method was minimum bactericidal concentration (abbreviation: MBC). Three crude plants extracts namely Artemisia monosperma, Artemisia cina and Artemisia argyi were found to show potential antibacterial properties against the isolated human pathogenic bacterial isolates. The results of MIC and MBC values of Artemisia monosperma for Enterococcus faecalis strains were at least concentration almost 2.3 and 4.1 mg/ml respectively, while MIC and MBC of Artemisia cina for Escherichia coli were highest concentration 3.9 and 4.9 mg/ml respectively. Moreover, MIC and MBC values for Pseudomonas aeruginosa, Staphylococcus aureus and Enterococcus faecalis strains was correspondent with MIC and MBC values of Escherichia coli for aqueous extracts of Artemisia species meanwhile it is Artemisia cina which showed maximum activity against Escherichia coli. Among the Artemisia species tested, Artemisia cina showed the most promising result. Form these results prove the antibacterial potential of the plants and hence provide support for the use of them in traditional medicine.

Keywords: Plants extract, Antibacterial activity, Human pathogens, MIC and MBC methods.

Artemisia is a huge diverse genus with shrubs and small herbs mostly found in northern temperate areas. The secondary metabolites and essential oils of *Asteraceae* family especially *Artemisia* species are valued for their essential oils and the remarkable medicinally. For many years, the Essential oils of *Artemisia* have been widely produced for medicinal purposes[1]. Different types of *Artemisia* have been described for their organic exercises. It is considered to deliver most restoratively essential optional metabolites[2,3].

A few intriguing investigations utilizing *Artemisia* spp. demonstrated a progression of antimicrobial and cancer prevention agent activities[4,5,6,7].

Restorative plants are Nature's blessing to individuals to enable them to seek after an ailment free solid life, and along these lines can assume a critical part in saving wellbeing. Plants have been utilized as medications by people since a huge number of years back. Today, all the world's societies have a broad learning of home grown drug. Customary solution depends on convictions and practices that existed before the improvement of purported "present day pharmaceutical" or "logical medication treatment". These practices are a piece of a nation's social legacy and are transmitted orally or by composed transmission[2].

Artemisia monosperma is appropriated in various Arab nations forsake, for example, Saudi Arabia and Iraq[8]. *Artemisia monosperma* is

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rumored in conventional drug for its antispasmodic, anthelmintic and hostile to hypertensive properties[9,10,11]. *Artemisia monosperma* answered to contain a few phytochemicals, for example, unpredictable oil[12], ûavonoids[13], alkaloids[14] and coumarins[15]. *Artemisia argyi* is a herbaceous enduring plant with a crawling rhizome. It is local to China, Japan and the far eastern parts of the previous Soviet Union. It is utilized as a part of natural pharmaceutical for states of the liver, spleen and kidney[16]. This examination planned to explore the efficacies of fluid concentrates of Artemisia species developing in Saudi Arabia against some human pathogenic microscopic organisms.

MATERIALS AND METHODS

Samples of plants

The plants (*Artemisia monosperma, Artemisia cina* and *Artemisia argyi*) were collected from different locations of Saudi Arabia in the spring of 2016G, therefore, identified by Herbarium taxonomists of Botany and Microbiology Department, Faculty of Science, the University King Saud (KSU). According to standardized procedure of the Botany and Microbiology Department, the plants were identified.

Preparation of aqueous extracts of *Artemisia* species

The Cutting into small pieces, grinding and soaking of the leafs plants (*Artemisia monosperma, A. cina* and *A. argyi*) were perform respectively. The soaked was rocked for 24 hours after diluted with distilled water to make 1: 3 (weight/volume). Then, a household blender was used, for one min at maximum speed, to homogenize the mixture. Then, using double layer of cheesecloth, the mixture was filtered. The filtered mixture was then centrifuged at 3000xg for 10 minutes with could temperature (4 °C). MF-Millipore Membrane Filter (0.45µm) was used to sterilize the supernatant liquid. This supernatant was stored at -20 °C for later use and referred to as aqueous extract.

Bacterial isolates

The following Gram positive and Gram negative bacteria isolates were used throughout this study; *E. coli 25696* , *Staph. aureus S9597, Ps. aeruginosa 22209, Entero. faecalis S10249*. The pathogenic bacterial strains were obtained from Riyadh Hospital (KSU), Saudi Arabia; therefore, four bacterial strains were used throughout this study.

Mueller-Hinton or/and blood medium agar were used to maintain the strains by sub-culturing on a 10-mm thick layer agar. All samples were incubated for 24 hours at 37°C. The same procedure was used for growth on Luria Bertani (LB) broth medium or/and Nutrient Broth medium. For long-term preservation, the bacteria were suspended in sterile 25% glycerol in sterile Tryptone Soya Broth and kept at 4°C or -80°C.

Minimum inhibitory concentration (MIC)

The broth media dilution method was used to determine the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) of the extract of *Artemisia monosperma, Artemisia cina* and *Artemisia argyi*. The final concentration of the extract was with mg/ml in brain heart infusion broth were inoculated with 100 µl of strains and were incubated at 37° C for 24 hour. The MIC was defined as the lowest concentration (mg/ml) of the extract resulting in clear broth media while minimum bactericidal concentration (MBC) was defined as the lowest concentration (mg/ml) of the extract resulting in no growth of bacteria after culture on agar media.

RESULTS AND DISCUSSION

The after effects of antibacterial action are given in the Table 1 and 2, which plainly demonstrate that every one of the concentrates at different focuses have indicated antibacterial action of against the whole tried creatures. Watery, water removes have indicated better action of all the four microorganisms. Fluid concentrate was more compelling against *E.coli* and less activity of *E. faecalis*. Comparative investigations somewhere else recorded antibacterial action of seed removes against *S. aureus, S. epidermidis, E. coli, and P. aeruginosa*[17].

Restorative plants keep on playing a focal part in the human services frameworks of extensive extents of the total populace, especially in creating nations, where home grown medication has a long and continuous history of use[18]. The present results are in agreement with Barbour *et al.* (2004)[19], Motavalizadehkakhky *et al*. (2013)[20], Moglad *et al.* (2012)[21], and Entezari *et al*. (2009)[22] with differing degrees of intensity[3].

Table 1. Minimum inhibitory concentration (MIC) of aqueous extracts of *Artemisia* species against some pathogenic bacteria

Bacterial specie	Strain	MIC (mg ml-1) *Artemisia monosperma*	*Artemisia cina*	*Artemisia argyi*
E.coli	U 25696	3.5	3.9	3.7
Pseudomonas aeruginosa	22209	3.3	3.7	3.7
Staphylococcus aureus	S 9597	2.4	2.9	2.7
Enterococcus faecalis	S 10249	2.3	3.6	2.7

Table 2. Minimum bactericidal concentration (MBC) of aqueous extracts of *Artemisia* species against some pathogenic bacteria

Bacterial specie	Strain	MBC (mg ml-1) *Artemisia monosperma*	*Artemisia cina*	*Artemisia argyi*
E.coli	U 25696	4.5	4.9	4.7
Pseudomonas aeruginosa	22209	4.6	4.7	4.7
Staphylococcus aureus	S 9597	4.2	4.3	4.2
Enterococcus faecalis	S 10249	4.1	4.3	4.2

The distinction in intensity might be because of the gathering phase of the plant sample, soil nature, other environmental factors, storage conditions, the part of plant used, method of extraction, method of screening, concentration of extract, and different sensitivity of the tested strain. In the present study, plant remove have antibacterial movement against tried life forms. This clearly indicates that these extracts might have different potential activity.

The search for new antimicrobial agents has been necessitated by the increase in antimicrobial resistance in recent years. Fifty thousand people die every day worldwide due to infectious diseases[23]. Natural plant products are a good source of new antimicrobials as they generally have low toxicity, cause minimal environmental pollution, have a low risk of development of resistance by pathogens[24], are cheap, and are generally safer than synthetic medicines[25]. The use of known medicinal plants is advantageous as they have been prescreened over thousands of years, resulting in a higher probability of isolating useful and safe compounds from them than from plants not in use by humans already26. Plants materials are either present in or have provided models for approximately 50% of drugs[25]. Screening *Artemisia* species for antibacterial activity was more likely to be successful as these plants are used for medicinal purposes.

The extracts from the three plants were generally more effective against *E.coli, Ps.aeruginosa* than *Staph. aureus* and *Entero.* faecalis. *E. coli*, *Ps. aeruginosa* are Gram-negative bacterium while *Staph. Aureus* and *Entero.faecalis* are Gram-positive, suggesting that the plant extracts are more efeffective against Gram-negative than Gram- positive bacteria. Finally, It is presumed that the plant remove have antibacterial action against tried life forms. The antibacterial movement of the plants might be because of the nearness of different dynamic standards in their takes off. Additionally ponders are expected to seclude and portray the bioactive standards to grow new antibacterial medications.

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