



Original Research Article

The study of antibacterial effects of alcoholic extracts of *Arum maculatum*, *Allium hirtifolium* and *Teucrium polium* against nosocomial resistance bacteria

Elaheh Safari¹, Mostafa Amiri², Abbas Bahador³, Mojtaba Amiri², Davoud Esmaeili^{1*}

¹Applied Microbiology Research center, and Microbiology Department, Baqiyatallah University Medical of Sciences, Iran

²Chemical Injuries Research Center, Baqiyatallah University of Medical Sciences, Molla-Sadra Street, Tehran, P.O. Box 19945-581, Tehran, Iran

³Department of Microbiology, Faculty of Medicine, Tehran University of Medical Sciences, Tehran, Iran

*Corresponding author

ABSTRACT

Keywords

Antibacterial effect;
Arum maculatum;
Teucrium polium;
Hospital isolates.

Overuse of antibiotics often causes increase of bacterial resistance to drugs. On the other hand the uncontrolled use of antibiotics causes adverse effects in humans. Plants have antimicrobial effects against specific pathogens and can serve as harmless replacement to antibiotics. We surveyed antibacterial effects of aqueous extracts of *A. maculatum* and *Allium hirtifolium* and *T. polium* on some strains of nosocomial hospital resistance bacteria. The antimicrobial effectiveness of the bactericide was confirmed. The minimum inhibitory concentration (MIC) of each extract was determined by measuring the non-growth zone diameter. The result indicates that *Allium hirtifolium* had inhibition effects more than *A. maculatum* and *T. polium*. This research indicates that *Allium hirtifolium* had more potent antibacterial effect than other extracts against. Further research on their antibacterial properties could lead to discovery of better antibacterial compounds

Introduction

Control of bacterial infections by inhibiting microbial growth has been a primary method of antimicrobial chemotherapy. With emerge problemes associated with chemotherapy use of new therapeutic strategy is interesting. Development of novel antibiotics is expensive therefore must replace new drugs. Recently, it has been realized that there is a need for a strategy that can inhibit very basic mechanisms of bacterial

resistant and virulence (Huerta *et al* ., 2008).

The spread of drug resistant in bacterial pathogens is one of the most earnest threats to successful treatment against bacterial infectious diseases. Several studies have demonstrated increasing of resistance rates in bacteria to chemotherapy. Down the ages essential oils and other extracts of plants have

evoked interest as sources of natural products. They have been screened for their potential uses as alternative remedies for the treatment of many infectious diseases (Owlia *et al.*, 2008).

There has been an premonition increase in rate of new and reemerging infectious diseases also another concern is the development of resistance to antibiotics in therapeutic centers.(Parekh *et al.*, 2008). The traditional medicinal methods, especially the use of medicinal plants ,still play a crucial role to overcome basic health problems (Raad *et al.*, 2013). Medicinal plants which have been used by humans for treatment of common infectious diseases are important elements of traditional medicine (Ghaleb *et al.*, 2006). Plants have the major advantages in medicine because still being the most effective and cheaper alternative sources of drugs (Pretorius *et al.*, 2001).

This research has been focused to develop therapeutic compounds from Iran plants as complement for drug candidates. Iran is one of the countries in the world for biological sources depending on different geographical, ecological. The *Arum maculatum*, *Allium hirtifolium* and *Teucrium polium* has been traditionally used reason theirs antiseptic and antibacterial properties for treatment of infectious diseases.

In order to validate its antibacterial properties with respect to traditional uses, we have screened the antimicrobial activity of parts of *Arum maculatum*, *Allium Hirtifolium* and *Teucrium polium* against different microorganisms of nosocomial Infection hospital (Mahboubim *et al.*, 2008). *Teucrium polium* has long been recognized in folk medicine in the treatment of many pathophysiological implications, such as

gastrointestinal disorders, inflammations, diabetes and rheumatism.Its extract has been shown to induce hypotensive, anti-inflammatory, and hypoglycemic, antispasmodic, antibacterial and antipyretic activities. Chemical analyses of *T. polium* have shown it to contain various compounds such as iridoids, flavonoids and cirsiliol.The present study was carried out to examine the antibacterial effects of *T. polium* on the afferent bactries of nosocomial Infection hospital. (Shakhanbeh *et al.*, 2001).

The Arum family, Aroidae, which numbers nearly 1.000 members, mostly tropical, and many of them marsh or water plants, is represented in Iran by a sole species. The leaves of the plant are used commonly by the local people as a vegetable. The roots of the *Arum maculatum* species are used in such treatments as diaphoretics, expectorants, and vermifuges. Terpenes or terpenoids are active against bacteria, fungi, viruses, and protozoa. A terpenoid constituent, capsaicin, has a wide range of biological activities in humans, affecting the nervous cardiovascular, and digestive system, as well as finding use as an analgesic (Ferdağ Colak *et al.*, 2009).

Shallot, scientifically called *Allium hirtifolium* Boiss., belongs to *Allium* genus and liliaceae family.Saponins, sapogenins, sulphuric compounds (thiosulfinates) and flavonoids, including quercetin and kaempferol, are found in different species of *Allium* genus. Disulphide and trisulphide compounds are amongst the most important compounds existing in *Allium* genus species.There have been reports about shallot having pharmacological effects, e.g. antioxidant,immune system regulating, anticancer and anti-trichomonas effects (Kazemi *et al.*, 2010).

Materials and Methods

Plant material and Preparation of extract

In this research selected a fresh leaves of *Arum maculatum* and flowering arial parts of *Teucrium polium*, *Allium hirtifolium* for effective extraction. This plant was collected from the mountains in - lorestan province (Iran) in spring 2012 and The plants were authenticated by baridge essence drug company. The special parts of plants were separated, cleaned and dried under shade at room temperature for one week, After that was dried plants were powdered mechanically. In preparation of the alcoholic extract was 500 g dried powder was macerated in 100 ml ethanol 80% and stand for 3 days. The solution was filtered for 3 times. The alcoholic extracts were concentrated using steam bath whereas a rotary evaporator was used to remove ethanol from the extracts then were stored in glass bottles in a refrigerator until used.

Screening of antibacterial activity

Those extracts of *Arum maculatum*, *Allium hirtifolium* and *Teucrium polium* was assayed against both gram positive (*S. aureus*, *P. acne* and *E.coli*) and gram negative bacteria (*E. coli*, *S. typhi*, *P. aeruginosa*, *A. baumani*, *K. pneumoniae*, *S. dysenteriae*, *S. typhi* and *S. aureus*).

This study is conducted according to the NCCLS 2004 standards and instructions. The following standard species used in this study are obtained from baqiyatallah hospital. In this research isolated nosocomial Infection hospital resistance bacteria's and identified using standard microbiological methods (Culture, biochemical tests, catalase, oxidase, morphology). They were grown on

Mueller-Hinton agar. After a 24h antimicrobial influence of non-growth diffusion zone was measured to confirm the results. The bactericidal effect of the extracts 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. At the end, the minimum inhibitory concentration (MIC) of each extract was determined through experiments by measuring the non-growth zone diameter according to the diffusion method.

Results and Discussion

The result indicates that *Allium hirtifolium* has inhibition effects more than *Arum maculatum* and *Teucrium polium*. The minimum inhibitory concentration (MIC) of each extract was determinate through experiments by measuring the non-growth zone diameter according to the diffusion method. In this research, *Allium irtifolium* antibacterial properties against *Pseudomonas aeruginosa* be more than *Arum maculatum* (5 mm non-growth diffusion zone). The non-growth diffusion zone *Teucrium polium* against *Staphylococcus aureus*, *A.baumani*, *K. pneumoniae*, *P. acne*, *E.coli* and *shigella dysenteriae*, *S. aureus* were 2mm. Inhibition zone *Arum maculatum* against *Pseudomonas aeruginosa* was 3 mm and in *Klebsiella pneumoniae*, *Shigella dysenteriae*, *Salmonella typhi*, *Staphylococcus aureus*, *Propionibacterium acne* and *E.coli* were 2.5 mm. Inhibition zone *Teucrium polium*, against *staphylococcus aureus* and *shigella dysenteriae* were 2cm and the non-growth

Table.1 Antimicrobial effect of *Arum maculatum* extract based on dilution method

Bacterial Species	Gram -/+	Inhibition zone diameter (mm)	Minimal concentration values (MIC) µg/ml
<i>P. aeruginosa</i>	-	3	3
<i>A. baumani</i>	-	3	3
<i>K. pneumonia</i>	-	2.5	2.5
<i>S. typhi</i>	-	2.5	2.5
<i>S. aureus</i>	-	2.5	2.5
<i>P. acne</i>	+	2.5	2.5
<i>E.coli</i>	+	2.5	2.5

Table.2 Antimicrobial effect of *Teucrium polium* extract based on dilution method

Bacterial Species	Gram -/+	Inhibition zone diameter (mm)
<i>P. aeruginosa</i>	-	-
<i>A. baumani</i>	-	-
<i>K. pneumonia</i>	-	-
<i>S. typhi</i>	-	2
<i>S. aureus</i>	-	2
<i>P. acne</i>	+	-
<i>E.coli</i>	+	-

Table.3 Antimicrobial effect of *Allium hirtifolium* extract based on dilution method

Bacterial Species	Gram -/+	Inhibition zone diameter (mm)	Minimal concentration values (MIC)
<i>P.aeruginosa</i>	-	5	5
<i>A. baumani</i>	-	R	-
<i>K.pneumonia</i>	-	2	2
<i>S.typhi</i>	-	2	2
<i>S.aureus</i>	-	-	-
<i>P.acne</i>	+	5	5
<i>E.coli</i>	+	2	2
<i>Enterococcus faecalis</i>	+	2	2

diffusion zone *Allium hirtifolium* against *P.aeruginosa* and *P. acne* were 5 mm and Increasing of antibiotic resistance is a serious problem in worldwide. Some medications and antibiotics have completely lost their medicinal effects, this problem causes to the development and creation of multiple disease resistance. Medicinal plants in the last decade used as

Klebsiella pneumoniae, *S.typhi*, *E.coli*, *Enterococcus faecalis* were 2mm. natural reservoirs of drug and because of

this have been discussed. Their advantages in relation to plant extracts are natural reservoir and laboratory experiments have shown no adverse effects. This research indicate that *Allium hirtifolium* have

antibacterial effects more than *Arum maculatum*, *Teucrium polium* against hospital isolates. Their antibacterial properties indicate that they can be introduced as a replacement antibiotic to treatment and complementary therapy.

In this study using plant extracts against these pathogens resulted in these which can be effective enough to reduce the rate of infection transmission.

Acknowledgement

We are so thankful of who helped me in this research Dr.Nasiri.

References

- Amiri, M., D. Esmaili, A. Sahlehnia, M. Ariana, F. Alam and Beiranvand, H. 2013. Study of antibacterial effects of *Satureja essence* against some common nosocomial pathogenic bacteria. *Inter. J. Curr. Microbiol. Appl. Sci.* 2 (7): x-xx
- Amiri, M., S. Mehrabian, D. Esmaili, Moj. Amiri, U. Panahi, E. Torabi and Atae, R. 2011. Study of Broad Spectrum Disinfectants Antibacterial effect against Common Nosocomial Bacteria. *J. Pure. Appl. Microbiol.* 1037-1040, October 2011
- Esmaili, D., A. Mohabati and Tohidpour, A. 2012. Anti-Helicobacter Pylori Activities of Shoya Powder and Essential Oils of *Thymus vulgaris* and *Eucalyptus globulus*. *The Open Microbiol. J.* 6: 65-69
- Ferdağ Çola, K., Filiz Savaroğlu and Semra İlhan. 2009. Antibacterial and Antifungal Activities of *Arum maculatum* L. Leaves Extracts. *J. App. Biol. Sci.* 3(3): 13-16.
- Ghaleb, A., A. Bassam and Kamel, A., et al., 2006. Antibacterial Effects of Nutraceutical Plants Growing in Palestine on *Pseudomonas aeruginosa*. *Turk. J. Biol.* 30:239-242.
- Huerta, V., K. Mihalik and Crixell, S.H., et al., 2008. Spices and Medicinal Plants Used In Hispanic Traditional Medicine Can Decrease Quorum Sensing Dependent Virulence in *Pseudomonas aeruginosa*. *Inter. J. App. Res. Nat. Product.* 2:9-15.
- Jigna Parekh., and Sumitra V. Chanda. 2008. Antibacterial Activity of Aqueous and Alcoholic Extracts of 34 Indian Medicinal Plants against Some *Staphylococcus* Species. *Turk. J. Biol.* 32:63-71
- Jumah Shakhaneh., and Omar Atrouse. 2000. *Teucrium polium* Inhibits Nerve Conduction and Carrageenan Induced Inflammation in the Rat Skin. *Turk. J. Med. Sci.* 31:15-21.
- Kazemi, S., S. Asgary and Moshtaghian, J. et al., 2010. Liver-Protective Effects of Hydroalcoholic Extract of *Allium Hirtifolium* Boiss in Rats with Alloxan-Induced Diabetes Mellitus. *ARYA. Atheroscler.* 6(1): 11-15.
- Mohaddese Mahboubi., and Ghasem Haghi. 2008. Antimicrobial activity and chemical composition of *Mentha pulegium* L. essential oil. *J. Ethnopharmacol.* 119 :325-327
- Parviz Owlia., Horieh Saderia, Iraj Rasoolib and Fatemeh Sefidkonc. 2009. Antimicrobial characteristics of some herbal Oils on *Pseudomonas aeruginosa* with special reference to their chemical compositions. *Iranian. J. Pharma. Res.* 8 (2): 107-114
- Raad N. Hasan., Mun'im R. Ali and Sinna, et al., 2013. Antibacterial activity of aqueous and alcoholic extracts of *Capsella bursa* against selected pathogenic bacteria. *American. J. BioSci.* 1(1) : 6-10