

Investigation of Antimicrobial Effect of *Diplotaenia turcica* Plant Growing in Van Province

Hamdullah Seçkin^{1*}, İsmet Meydan¹

¹Van Vocational School of Health Services, Van Yüzüncü Yıl University, Zeve Campus, 65080 Van, Turkey
e-mail:hamdullahseckin@yyu.edu.tr

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Abstract

Developing defense mechanisms against antibiotics and derivatives of microorganisms that cause infection has led to the search for new antibiotics. Many antibiotics have been isolated from plants so far. Therefore, scientists have made numerous studies on plants for the discovery of new antibiotics and continue to do so. In this study, the antimicrobial effect of extracts of *Diplotaenia turcica* was investigated, plants were collected from Van Çatak district. The roots and topsoil parts of *Diplotaenia turcica* were separated and extracted. The samples were dissolved in alcohol and ether. The pathogens used in this study were *Escherichia coli* ATCC 25952, *Bacillus subtilis* ATCC 6633, *Pseudomonas aeruginosa* ATCC 27853, *Enterococcus faecalis* ATCC 29212, *Candida albicans* ATCC 90028. The effects of extracts on pathogens were determined using disc diffusion method. When the zones of plant extracts were examined, it was seen that the extract obtained from root parts of *Diplotaenia turcica* showed the highest inhibitory effect against *Bacillus subtilis* and the extract obtained from the topsoil parts of *Diplotaenia turcica* showed the highest inhibitory effect against *Escherichia coli*.

Keywords: *Diplotaenia turcica*, Extraction, Antimicrobial Effect

Van İlinde Yetişen *Diplotaenia turcica* Bitkisinin Antimikrobiyal Etkisinin Araştırılması

Özet

Enfeksiyon sebebi olan mikroorganizmaların antibiyotik ve türevlerine karşı savunma mekanizmaları geliştirmeleri, yeni antibiyotiklerin araştırılmasına yol açmıştır. Bitkilerden şimdiye kadar birçok antibiyotik izole edilmiştir. Bundan dolayı bilim adamları, yeni antibiyotiklerin keşfi için bitkiler üzerinde sayısız çalışma yapmış ve yapmaya devam etmektedirler. Bu bağlamda mevcut çalışmamızda Van Çatak ilçesinden toplanan endemik bir tür olan *Diplotaenia turcica* bitkisinden elde edilen ekstraktların antimikrobiyal etkisi araştırılmıştır. *Diplotaenia turcica* bitkisinin kök ve toprak üstü kısımları ayrılarak ekstrakt haline getirilmiştir. Numunelerin alkol ve eter içerisinde çözünmesi sağlanmıştır. Çalışmada kullanılan patojenler *Escherichia coli* ATCC 25952, *Bacillus subtilis* ATCC 6633, *Pseudomonas aeruginosa* ATCC 27853, *Enterococcus faecalis* ATCC 29212, *Candida albicans* ATCC 90028 olarak belirlenmiştir. Disk difüzyon metodu kullanılarak ekstraktların patojenler üzerine etkileri tespit edilmiştir. Bitki ekstraktlarının oluşturduğu zonlar incelendiğinde *Diplotaenia turcica* bitkisinin kök kısımlarından elde edilen ekstraktın *Bacillus subtilis*'e ve gövde kısımlarından alınan ekstraktın *Escherichia coli*'ye karşı en yüksek inhibitör etkiyi gösterdiği görülmüştür.

Anahtar Kelimeler: *Diplotaenia turcica*, Ekstraksiyon, Antimikrobiyal etki

Introduction

Today, the rapid increase of the population has caused an increase in nutrition and health problems along with environmental problems. Despite advances in the scientific world, it has made it necessary to use natural resources for the discovery of new antimicrobial agents in the medical field, as they develop defense mechanisms against antibiotics and derivatives of microorganisms that cause infection.

Antibiotic resistance was noticed in 1979 and now affects the whole world very seriously (Adawiyah, 2010). One of the reasons for the formation of antibiotic resistant bacteria is excessive and unconscious use of antibiotics. Therefore, the cost of health services increases (Chingizova et al. 2017). The active substances used for the treatment of many diseases are obtained from medicinal plants (Faydaođlu and Riderođlu 2013). It is called metabolite, or 'phytochemical' secondary to the compounds produced and stored by some plants, which do not have much nutritional value but are beneficial for health (Uzunhan, 2014). Akçiçek (2010), in his study, determined that the olive leaf has antimicrobial effect against microorganisms by detecting the antipyretic effect.

Diplotenia turcica is a perennial plant with a woody root structure of about 1.5-2 m length. Although it is an endemic plant, *diplotenia turcica*, which blooms in white in August, is known as “siyabo” among the public (Deđer et al. 2017). It has been determined that increasing doses of *Diplotenia turcica* root extract are applied to diabetic rats to be beneficial for histopathological and immunohistochemical diabetic effect and reduction of oxidative stress (Ozdek et al. 2018). *Diplotenia turcica* plant is used by the locals in meals and treatments and also participates in the structure of herbed cheese. In addition, the root part is used especially for diabetics, blood pressure patients and rheumatic diseases (Uce and Tunçtürk, 2014).

In this study, it is aimed to investigate the effect of *Diplotaenia turcica* plant, which is grown in a certain region in our country and used for various purposes, on some pathogenic microorganisms.

Materials and Methods

Material

Diplotenia turcica (siyabo) used in the study was collected from Van Çatak district (Figure-1). The above-ground parts and root of the plant were cut into small pieces and left to dry, which does not see the sun. The dried root and aboveground parts were converted into powder for a grinder. 10 g of the materials were weighed and left in 100 ml of solvent for 48 hours. As a solvent; deionized water, ethanol and ether were used. The solutions were then passed through the evaporator, allowing the solvents to evaporate.



Figure 1. *Diplotenya turcica* plant

Test Microorganisms

Pathogenic microorganisms used in the study; *Escherichia coli* ATCC 25952, *Bacillus subtilis* ATCC 6633, *Pseudomonas aeruginosa* ATCC 27853, *Enterococcus faecalis* ATCC 29212, *Candida albicans* ATCC 90028. Microorganisms were obtained from Van Yüzüncü Yıl University, Faculty of Science, Molecular Biology and Genetics Department Laboratory.

Determination of Antimicrobial Activity

The microorganisms to be used in the study were activated in Müller Hinton medium. Extracts prepared using disc diffusion method were tested on strains (Murray et al. 1995). Stock microorganisms were incubated at 37 °C for 48 hours in Müller Hinton medium. 0.1 ml of the live culture with 10⁻¹ dilution was taken with the aid of a micropipette and spread over the solid Nutrient Agar medium. After the agar was allowed to absorb the bacterial solution, the extracted impregnated discs were pressed lightly with the help of sterile forceps and placed regularly in the medium. Neomycin antibiotics were used as positive control. The plates were kept at 37 °C for 48 hours for incubation. Then, antimicrobial activity of extracts was determined by measuring inhibition zone diameters (Ertuş et al. 2012).

Results

The diameters of the inhibition zone created by the extracts, which obtained from the aboveground parts and root of the *Diplotenya turcica* (siyabo) plant, against bacteria are measured and given in Table-1. Accordingly, the highest inhibitory effect of the extract obtained from the aboveground parts of the *Diplotenya turcica* plant was found to be against *Escherichia coli* bacteria. In addition, it has been observed that it

affects *Enterococcus faecalis* bacteria. The highest inhibitory effect of the extract obtained from the root part of *Diplotenia turcica* plant was found to be against *Bacillus subtilis* (Figure 2) bacteria. It has also been observed to affect *Pseudomonas aeruginosa* and *Escherichia coli* bacteria.

Table 1. Zone diameters of the above-ground and root extracts of *Diplotenia turcica* (siyabo) against pathogenic microorganisms

Test Microorganisms	Extracts							
	Above ground parts				Root part			
	Water	Etanol	Eter	Neomycin	Water	Etanol	Eter	Neomycin
<i>Escherichia coli</i>	-	10	12	22	8	11	10	21
<i>Bacillus subtilis</i>	8	9	10	18	8	16	12	19
<i>Pseudomonas aeruginosa</i>	8	10	9	11	9	15	11	11
<i>Enterococcus faecalis</i>	8	10	9	10	9	-	-	10
<i>Candida albicans</i>	8	9	10	20	8	9	-	20

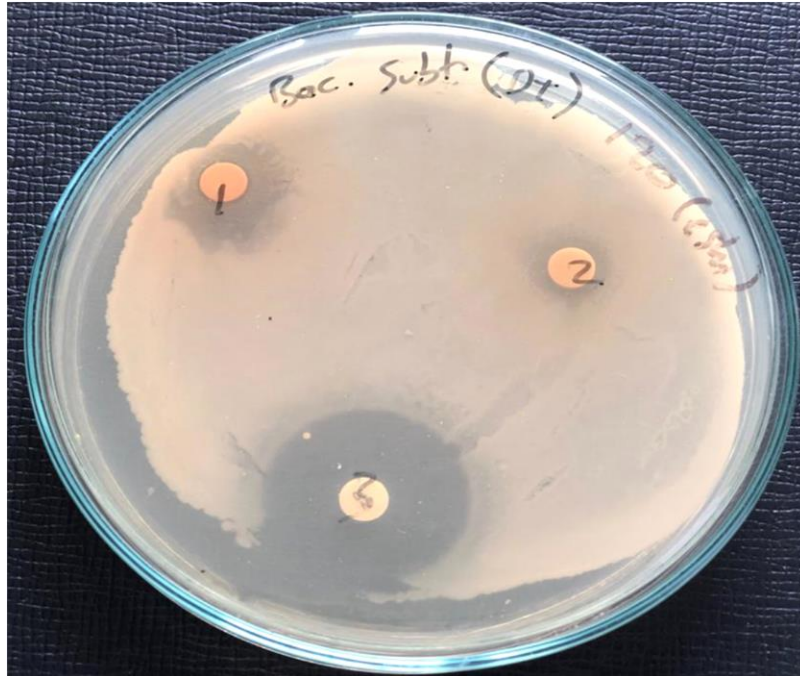


Figure 2. Zones formed by root extract against pathogenic microorganisms.

Discussion and Conclusion

Pomegranate peel and slice membrane showed antibacterial activity against *Bacillus megaterium* and *Staphylococcus aureus* (Türkyılmaz et al. 2017). Jujube plant's fruit extract, antimicrobial effect against some pathogenic bacteria were examined and it was found to be very effective against *Staphylococcus aureus* 29213, a Gram positive bacteria (Özkan, 2017). He studied the effects of oils from *Origanum Onites Rosmarinus Officinalis* and *Stevia Rebaudiana* on some gram (+) and gram (-) bacteria. In particular, it has seen that the *Origanum onites* plant affects all bacteria (Uçar, 2015). In our study, it was found that the extract from the aboveground parts of the *Diplotenia turcica* plant is effective against the bacteria *Escherichia coli*, a Gram (-) bacterium. The extract obtained from the root part of the plant has been shown to form a good zone against *Bacillus subtilis* bacteria, a gram (+) bacterium.

In the study of determining the antibacterial activity of the Işgın (*Rheum ribes L.*) plant, it was found that extracts prepared with ethanol had a significant effect on microorganisms (Tanis, 2010). It has been concluded that *Equisetum arvense*, *Plantago lanceolata* and *Olea europaea* leaf extract can be effective against many pathogens that produce beta lactamase, especially methicillin resistant *Staphylococcus aureus*, in many areas such as health, pharmaceutical industry, cosmetics and food (Aşkar, 2019). The extracts prepared from some unused parts of industrial plants (green tea stalk, corn tassel and olive leaf) have been investigated and their antimicrobial effects on some salmonella species (*S. Infantis*, *S. Enteritidis* and *S. Typhimurium*) that are resistant to at least 5 antibiotics, and extracts against these pathogens. It has been determined to be effective (Salar, 2015). It is seen that the root extract we have prepared gives a better zone than water and ether especially when ethanol is used as a solvent. In particular, the content analysis of the *Diplotenia turcica* plant, which is used as a food, makes it possible to make an active ingredient diagnosis, making it strong that it can contribute to the field of medicine and pharmacy.

The extracts obtained from some macroalgae (*Ulva rigida* and *Gracilaria verrucosa*) collected from the Izmir coast were dissolved in ethyl alcohol and the antimicrobial effect was investigated against 6 bacteria and 2 fungi species with the help of disc diffusion method. Extracts have been shown to be effective against other microorganisms except *Aspergillus brasiliensis* (Silver, 2016). Methanolic extracts of *Anthemis tinctorial L.*, *Matricaria chamomilla L.* and *Achillea biebersteinii* species belonging to Asteraceae family were applied to *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa* and *Salmonella enteritidis* pathogens for antibacterial activity. When the zones formed are taken into account, it is stated that plant extracts can be used for alternative treatment purposes (Kilic, 2018). The antimicrobial effect of the extracts obtained from the *Diplotaenia turcica* plant collected from Van Çatak district on gram (+) (*Enterococcus faecalis* ve *Bacillus subtilis*), gram (-) (*Pseudomonas aeruginosa* and *Escherichia coli*) and *Candida albicans* fungus, which is the infection agent on the skin, was investigated. As a result, *Diplotaenia turcica*, which is an endemic plant, has the potential to be used in the field of health. It is thought that it will contribute to the world of science as a result of more comprehensive analysis.

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