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Research Article

The antimicrobial activity of *Physalis peruviana* L.

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Abstract

In this study, the antimicrobial activity of *P. peruviana* was investigated. The antimicrobial activity was evaluated according to the microdilution method by using *B. megaterium*, *P. aeruginosa*, *E. coli*, *K. pneumoniae*, *P. vulgaris*, *E. aeregenes*, *C. albicans*, *C. globrata*, *C. tropicalis*, *Trichophyton* sp. and *Epidermaphyton* sp. In the end of experimental studies, the fruit extract of *P. peruviana* was inhibited the growth of microorganisms used in the test at different ration. MIC values of fruit was determined as 128-1054-µg/ml.

Keywords: Antimicrobial activity, *P. peruviana*, medicinal plant, test microorganisms

1. Introduction

Plants, as sources of medicinal compounds, have continued to play a dominant role in the maintenance of human health since ancient times. The World Health Organization estimates that plant extracts or their active constituens are used as folk medicine in tradional therapies of 80% of the worlds population (Anonymous 1993). Over 50% of all modern clinical drugs are of natural product orgin (Baker et al. 1995). Turkish pepople have a tradition of using a number of plant species for the treatment of infectious diseases and various ailments (Baytop 1984).

The effect of plant extracts on microorganism have been studied by a very large number of researchers in different parts of the world (Mahansen 1996; Kıvçak et al. 2002; Uzun et al. 2002; Ateş et al. 2003; Dülger 2005; Kırbag et al. 2005; Nair 2005; Şengül et al. 2005; Kumar et al. 2006; Mathabe et al. 2006).

Physalins, isolated from *P. angulata* have been shown to possess anti-tumor and anti-inflammatory activities (Chıang et al. 1992 ; Soares et al. 2003; Vieria et al. 2005; Magalhes et al. 2006). The fresh fruits of *P. peruviana* are used as strengthen the immune system, lowering blood sugar, destroys intestinal parasites and healing of skin diseases.

The aim of the present study was to evalute the antimicrobial activity of *P. peruviana.*

2. Materials and Methods

2.1. Materials

P. peruviana was purchased from Elazığ, Turkey.

2.2. Extract preparation

The fruits of *P. peruviana* were crushed. The material 10 gr was extracted in 150 ml solvent by kept on a rotary shaker for 24 h. Then, it was filtered through Whatman No: 1 filter. The sample were further concentrated to dryness under reduced pressure at 37°C using a rotary evapotor. It was dissolved in dimethyl sulfoxid and stored at 4°C for further studied.

2.3. Test microorganisms

A total 6 bacteria (*Bacillus megaterium* DSM 32, *Proteus vulgaris* FMC 1, *Klebsiella pneumoniae* FMC 66032, *Escherichia coli* ATCC 25922, *Pseudomonas aeruginosa* DMS 50071, *Enterobacter aeregenes* CCM 2531), 3 yeasts (*Candida albicans* FMC 17, *Candida glabrata* ATCC 66032, *Candida tropicalis* ATCC 13803) and 2 dermatophyte species (*Trichophyton* sp. and *Epidermophyton* sp.) were used in the present investigation. Microorganisms were provided by the Department of Biology, Science Faculty, Fırat University, Microbiology Laboratory, Elazığ-Turkey.

2.4. Preparation of microbial cultures

The bacterial strains were inoculated into nutrient broth and yeast strain inoculated in to malt extract broth and sabouraud broth for 24 and 48 h, respectivelly.

2.5. Microdilution assays

The Minimal Inhibitory Consentration (MIC) values of active extracts were determined according to the method of micro dulitions (NCCLS 2000). The inocula of microorganisms were prepared from 12 h broth cultures and suspensions were adjusted to 0.5 McFarland standard turbidity. Test sample was dissolved in DMSO at an initial concentration of 1024 µg/mL and then were serially which is the lowest concentration of sample. A set of tubes containing only inoculated broth was kept as control. Ampicillin and Fluconazole were used as antibiotic reference for bacteria and yeast, respectively. The MIC was defined as the lowest concentration of the compounds to inhibit the growth of microorganisms.

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3. Results and Discussion

The antimicrobial effects of the fruit was observed to 1054-128 µg/mL MIC value against the tested microorganisms (Table 1).

MIC value was found to be 1054 µg/mL for *E. coli* and *Epidermophyton* sp. as seen in Table 1. This value was determined to 512 µg/mL for *B. megaterium*, *K. pneumonia*, *P. vulgaris*, *C. albicans*, *C. tropicalis* and *C. globrata*. The concentration inhibiting growth of *E. aerogenes* was determined as 256 µg/mL and also observed to be very high in *P. aeruginosa* 128 µg/mL as seen in Table 1. The fruit extract of *P. peruviana* showed that the maximum activity against to *Enterobacter (*The MIC value's of it is 128 µg/mL) as seen in Table 1. MIC value is determined the lowest for standarts.

Table 1. The MIC values of *P. peruviana* against the microorganisms

	MIC Values (µg/ml)	
Microorganisms	**Sample**	**Standart**
Escherichia coli	1054	2
Bacillus megaterium	512	2
Klebsiella pneumoniae	512	2
Proteus vulgaris	512	2
Enterobacter aerogenes	256	2
Psedomonas aeruginosa	128	2
Candida albicans	512	8
Candida globrata	512	8
Candida tropicalis	512	8
Trichophyton sp.	512	-
Epidermaphyton sp.	1054	-

In one study, the MIC values against bacteria physalin D was detected in 32-128 µg /mL. The MIC values of the extract for fungi were detected between 256 to 512 µg/mL (Helvacı et al. 2010).

Another study investigated the effect of micro-organisms of essential oils of *P. angulata*. The sensitivity of *B. subtilis*, *K. pneumoniae*, *P. aeruginosa*, and *S. aureus* to the essential oils of both aerial and root parts have been determined. *P. aeruginosa* have been resistant to the essential oil from both aerial and root part of the plant. *C. torulopsis*, *C. stellatoidea* and *C. albicans* were susceptible to the essential oils from the aerial and root part of the plant. The minimum inhibitory concentrations ranging between 3.75mg/mL and 4.0mg/mL have been recorded for *B. subtilis* and *K. pneumoniae* by the aerial and the root extracts, respectively, but *P. aeruginosa* and *S. aureus* have been not susceptible to the aerial and root extracts (Osho et al. 2010).

The effects of many medicinal plant extracts may be used as response to spesific healt problems. The mentioned researchers claimed that sensitivity of microorganism to chemoterapeutic compounds can change even against different strains. In similar studies (Chiang et al. 1992; Mahansen 1996; Kıvçak et al. 2002; Uzun et al. 2002; Ateş et al. 2003; Soares et al. 2003; Dülger 2005; Kırbag et al. 2005; Nair 2005; Şengül et al. 2005; Vieria et al. 2005; Kumar et al. 2006; Mathabe et al. 2006; Magalhes et al. 2006), the extract of various plants inhibited the growth of some microorganisms at different ration. Different plants possess different constituents in different concentration, which account for differential antimicrobial effect, as also suggested. The potential for developing antimicrobials from higher plants appears rewarding as it will lead to the development of a phytomedicine to act against microbes. Plant based antimicrobials have enermous theropeutic potential as they can serve purpose. With lesser side effects that are often associated with synthetic antimicrobials. Contiuned further exploration of plant-derived antimicrobials is needed today. Further research is necessary to determine the identitity of the antibacterial compounds from within these plants and also to determine their full spectrum of efficacy (Parekh et al. 2007).

In the end of studies, we have found the fruit juice of *P. peruviana* revealed antimicrobial activities against the most of bacteria, yeasts, and dermatophyta. The results suggest that those extracts may possess compounds with antibacterial and antifungal properties that can be used as antimicrobial agents in the development of new drugs for the treatment of infectious disease. *P. peruviana* can be used as an antimicrobal agent in development of new drugs for the treatment of infectious disease.

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