EFFECT OF ECBALLIUM ELATERIUM FRUIT ON CANDIDA ALBICANS, ASPERGILLUS FUMIGATUS AND ESCHERCHIA COLI

Yekta Farmahini Farahani¹, Gholamreza Amin², Soroush Sardari³ and Nasser Ostad⁴

¹Department of Pharmacy, Faculty of Pharmacy, Tehran University of Medical Science, Tehran, Iran, 14155
²Drug Design and Bioinformatics Unit, Medical Biotechnology Department, Biotechnology Research Center, Pasteur Institute of Iran, Tehran, Iran, 13164
³Department of Toxicology & Pharmacology and Pharmaceutical Science Research Center, Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran, 14155
⁴Corresponding author’s email: ssardari@hotmail.com

ABSTRACT

The fruit juice of Ecballium elaterium was used as a traditional medicine in Iran and in folk medicine. This plant, which is endemic to Turkey, is applied for the treatment of sinusitis in the countries of the region including Iran. The ethanolic extracts of three parts of E. elaterium fruit (seeds, liquid contents and flesh of the fruit) were tested against Candida albicans, Aspergillus fumigatus and Escherchia coli at the concentration range from 7.8 to 1000 microgram per milliliter by microbroth dilution method. This is the first report showing the activity of the extracts of 3 parts of E. elaterium fruit, include seeds, liquid contents and flesh that are effective against E. coli, C. albicans and A. fumigatus at the concentration of 1000 µg/ml.

KEYWORDS: Aspergillus fumigatus, Candida albicans, E. coli, Ecballium elaterium, Ethanolic extract.

INTRODUCTION

Ecballium elaterium (L.) A. Rich., the squirting cucumber or spitting cucumber, from the Cucurbitaceae family, is a medicinal plant, widely found in the wild South-West Europe, North Africa, the Mediterranean region and North-West of Iran in stony ground, in the rubble and downhill (Greige-Gerges et al., 2007). This plant is recognized as grass officinal herb and in the Mediterranean valley has a lengthy traditional use. It is often applied in edema, particularly pulmonary edema and also as a revulsive in brain diseases (Felter and Loyd, 1905). Cucurbitacins and their glycosylated derivatives have been responsible for many biological activities of this species such as antiproliferative activity on various types of cancer cells (Blaskovich et al., 2003; Sun et al., 2005). But the most interesting potential activity of E. elaterium can be antiviral (Boullard, 2001). On the other hand, there is a previous report on In vitro antimicrobial activity of extracts of E. elaterium fruit that screened against C. albicans and Staphylococcus aureus. This study showed that the combination of E. elaterium and penicillin can be more effective than penicillin alone, and E. elaterium can be more effective than bifonazole in C. Albicans (Adwan et al., 2011; Yesilada et al., 1988). Here we report the activity of the E. elaterium fruit against fungi and a bacterium.

MATERIALS AND METHODS

Ecballium elaterium fruits were collected from its natural habitat in the region of Ahar (North of Tabriz) during the months of September (2012), and seeds, fleshy and liquid content of fruit were separated. The fleshy and seeds parts were dried away from direct sunlight. A dry powder of the plant of each part (fleshy and seeds of fruit) and liquid content was extracted by the mixture ethanol-water (70:30, v/v). The extracts were carried under percolation. The ethanolic extracts were evaporated to dryness at 50°C under reduced pressure in rotary evaporator. For defatted extracts, the drying process was carried out by freeze-drying.

Minimum inhibitory concentration (MIC) of ethanolic extracts of three parts of E. elaterium fruit, which were dissolved in Dimethyl sulfoxide (DMSO), were determined by the micro dilution broth method as described by National Committee for Clinical Laboratory Standards (NCCLS) (NCCLS, 2000). E. elaterium ethanolic extracts were serially diluted in Sabouraud Maltose broth for C. albicans, A. fumigatus and in Nutrient Broth for E. coli and then each micro-organisms inoculum size of 1 x 10⁵ CFU/mL was added to each well. Controls with broth, DMSO, broth without anything (negative control), and broth with micro-organism (positive control) were included in the experiments. In these tests, amphotericin B and fluconazol are the standard controls for C. albicans and A. fumigatus, and streptomycin is the standard control for E. coli. Each test strain of micro-organism was run in duplicate. The test plates were incubated at 37°C for 24 and 48 h. The MIC was taken as the minimum concentration of the dilutions that inhibited the growth of the test micro-organism.
RESULTS AND DISCUSSION

Results showed that *A. fumigatus*, *C. albicans* and *E. coli* are responsive organisms to ethanolic extract of *E. elaterium* fruits. The MIC values of 3 parts of *E. elaterium* fruit extracts against *A. fumigatus*, *E. coli* and *C. albicans* were shown in Table 1.

Plants are the major sources of natural products and extensively use in under developing countries due to low cost, affect a broad range of microorganisms, and these herbal medicine have fewer adverse effects (Boulland, 2001). In the present study, ethanolic fruit extracts of *E. elaterium* showed strong antifungal and antibacterial activity against *A. fumigatus*, *C. Albicans* and *E. coli*. Similar results were reported by Oskay et al. (2010) who found that ethanolic extract of *E. elaterium* have antibiotic activity against multidrug resistant bacteria. According to Dougruz et al. (2008), aqueous extract of *E. elaterium* did not show antibacterial activity against different bacterial species using agar well diffusion method. The variation in the results may be due to different genera of bacteria and methodology. Further study is needed to identify the active compounds, the mode of action and possible toxic effect of fruit extract of *E. elaterium* *in vitro* on a range of bacteria and fungi.

<table>
<thead>
<tr>
<th>Microorganisms</th>
<th>Seed extract</th>
<th>Flesh extract</th>
<th>Liquid content extract</th>
<th>Amphotericin B</th>
<th>Fluconazole</th>
<th>Streptomycin</th>
<th>Positive control</th>
<th>Negative control</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>C. albicans</em></td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1.56</td>
<td>1000</td>
<td>nt*</td>
<td>+b</td>
<td>-</td>
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<tr>
<td><em>A. fumigatus</em></td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1.56</td>
<td>1000</td>
<td>nt</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td><em>E. coli</em></td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>nt</td>
<td>nt</td>
<td>31.25</td>
<td>+</td>
<td>-</td>
</tr>
</tbody>
</table>

* denotes not tested (not the target organism); b shows growth; c no growth

REFERENCES


NCCLS, National Committee for Clinical Laboratory Standards. (2006). *Methods for dilution antimicrobial susceptibility tests for bacteria that grow aerobically*. Clinical Laboratory Standards Institute, pp. 64.


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