

Antimicrobial Activity of Grapefruit Seed

Greyfurt Tohumunun Antimikrobiyal Aktivitesi

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ABSTRACT

Citrus paradisi Macfad. (Rutaceae), evergreen tree originally of Asiatic South West, is also known as grapefruit. The fruit is known as an effective pharmacological remedy and is used to prepare different cosmetic products. The aim of this study was to investigate the antimicrobial activity of aqueous and ethanolic grapefruit seed extracts and also glycerol solution of grapefruit seed against some bacteria and yeast. Disc diffusion method was used to determine the antimicrobial activity. Depending on the results, none of the grapefruit seed samples showed antimicrobial activity against all tested microorganisms. Although the antimicrobial activity of grapefruit seed has been reported in many publications, this difference may be due to the variation in the contents of polyphenols, especially flavonoids.

Keywords: *Citrus paradisi*, grapefruit seed, antimicrobial activity

ÖZET

Citrus paradisi Macfad. (Rutaceae), greyfurt olarak da bilinen, her daim yeşil Güney Batı Asya kökenli bir ağaçtır. Meyvesinin farmakolojik açıdan etkili olduğu bilinmekte ve farklı kozmetik ürünlerin içeriğinde kullanılmaktadır. Bu çalışmanın amacı, greyfurt tohumunun etanol, su ekstraktlerinin ve gliserol solüsyonunun bazı bakteri ve maya suşlarına karşı antimikrobiyal aktivitesinin araştırılmasıdır. Antimikrobiyal aktiviteyi belirlemek için disk difüzyon yöntemi kullanılmıştır. Elde edilen sonuçlara göre, örneklerden hiçbiri test edilen mikroorganizmalara karşı antimikrobiyal aktivite göstermemiştir. Greyfurt tohumunun antimikrobiyal aktivitesi pek çok yayında rapor edilmiş olmasına rağmen, sonuçlarımızdaki farklılığın, flavonoidler gibi polifenolik bileşiklerin miktarının değişik olmasından kaynaklanabileceği düşünülmektedir.

Anahtar kelimeler: *Citrus paradisi*, greyfurt tohumu, antimikrobiyal aktivite

1. Introduction

Citrus paradisi Macfad. (grapefruit) is a subtropical fruit tree which belongs to the family Rutaceae [1]. Grapefruit is a rich source of vitamin C, phenolic compounds (flavonoids, phenolic acids and coumarins) and terpenic substances (such as carotenoids and limonoids). It is well known that these bioactive compounds act as free-radical scavengers and they modulate enzymatic

activity and protect human against a variety of diseases [2-4]. Phenolic compounds present in grapefruit play an role in the antioxidant capacity of grapefruit juice which is related to the prevention of different chronic diseases such as cardiovascular diseases, diabetes, obesity and cancer. It is also known that consumption of grapefruit helps to lose weight and improves lipid metabolism [5-8]. In traditional medicine, *Citrus paradisi* seed extracts have been used for

treatment of various diseases such as ulcers, urinary and alimentary tract infections [9-10]. Antimicrobial activity of grapefruit seed extract has been reported in many studies and its antimicrobial activity is related with the flavonoids, such as naringin, quercetin and kaempferol, tocopherols, limonoids, citric acid, and other compounds [11-13]. The purpose of this study was to investigate the antimicrobial activity of aqueous and ethanolic grapefruit seed extracts and also glycerol solution of grapefruit seed against some bacteria and yeast.

2. Material and Methods

2.1. Preparation of Samples

Grapefruit seed samples were collected from Antalya-Turkey. Aqueous and ethanolic grapefruit seed extracts and glycerol solution of grapefruit seed were used in the study. Grapefruit seed samples were air-dried and powdered. Ethanolic extract was prepared with 70% ethanol by Soxhlet for 3 hr, then concentrated and lyophilized. Aqueous extract was prepared with distilled water for 24 hr and lyophilized. Glycerol solution of grapefruit 33% (g/mL) was prepared with glycerol for 24 hours using a magnetic stirrer then filtered.

2.2. Antimicrobial Activity

Aqueous and ethanolic grapefruit seed extracts and glycerol solution of grapefruit seed were screened for their potential in vitro antibacterial activities against *Staphylococcus aureus* ATCC 25923, *S. aureus* ATCC 43300 (methicillin-resistant *S. aureus*), *Enterococcus faecalis* ATCC 29212, *Bacillus subtilis* ATCC 6633, *Escherichia coli* ATCC 25922, *Pseudomonas aeruginosa* ATCC 27853, *Klebsiella pneumoniae* RSKK 574 and antifungal activities against *Candida albicans* ATCC 10231. Disc diffusion method was used to determine the antimicrobial activity. The inoculums were suspended in sterile saline and diluted according to 0.5 McFarland standard and then spread on Mueller Hinton Agar (Difco, Difco Laboratories, Detroit, MI, USA) plates. Empty paper discs (6 mm in diameter) were impregnated with 20 µL of the extracts (250 mg/mL) - glycerol solution (33% g/mL) and placed on the inoculated plates. These plates, after remaining 15 min at room temperature, were incubated at 37°C for 24 h. After incubation, the inhibition zones (mm) were measured. Ampicillin (10 µg), ciprofloxacin (5 µg) and fluconazole (25 µg) were used as control. Experiments were repeated twice [14, 15].

3. Results and Discussion

Grapefruit (*Citrus paradisi* Macfad.) has a yellow or yellow-red hesperidium and juice of grapefruit has sour bitter taste. A popular fruit consumed as fruit juice and nu-

trients [10]. In a study, grapefruit seed was extracted with 70% ethanol and then for microbiological test 33% (m/V) extract was prepared using 70% ethanol. The extract was examined against 20 bacterial and 10 yeast strains by agar diffusion method. Extract showed the strongest antimicrobial activity against *Salmonella enteritidis* [11]. In another study, grapefruit seed was extracted with 50% ethanol and major compounds were isolated (obacunone, nomilin, limonin, nomilic acid and obacunone-17-O-β-D-glucopyranose). None of the compounds showed antimicrobial activity against *S. aureus* NCTC 6571, *E. coli* NCTC 10418, *B. subtilis* NCTC 8216, *P. aeruginosa* NCTC 10145 [10].

Krajewska-Kulak et al [16] investigated the antimicrobial activity of 33% grapefruit-water glycerol solution (GWS; Cinatamani, Poland) which is dissolved in 1% DMSO against the yeast-like fungi, dermatophytes and molds. They found that 33% grapefruit-water glycerol solution exerted potent antifungal activity against the yeast-like fungi strains and lower activity against dermatophytes and molds.

Grapefruit juice inhibits the CYP3A4 enzyme of the cytochrome P450 system in the intestinal mucosa that results increasing the bioavailability of drugs with a high first pass metabolism. Serious adverse reactions can be seen because of this interaction. Patients should consume grapefruit carefully due to drug interactions [17].

Al-Âni et al [18] reported that aqueous grapefruit seed extract showed good antimicrobial activity against *S. aureus*, *Proteus vulgaris*, *K. pneumonia* and *C. albicans* but ethanolic grapefruit seed extract did not show any antimicrobial activity. In our study, none of the grapefruit seed samples (aqueous grapefruit seed extract, ethanolic grapefruit seed extract and glycerol solution of grapefruit seed) showed antimicrobial activity against test microorganisms. There are many studies reported the antimicrobial activity of grapefruit seeds, in our study we didn't observed any antimicrobial activity against the tested microorganisms. This difference may be due to the variation in the contents and quantities of polyphenols, especially flavonoids (naringin, quercetin, kaempferol etc.). Phytochemical contents and biological activities of plants may vary according to the geographical region, climatic conditions, gathering times of plants [19, 20].

4. Conclusions

Although the antimicrobial activity of grapefruit seed has been reported in many publications, difference in our findings may be due to the variation in the contents of polyphenols, especially flavonoids.

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