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Antifungal effect of apricot leaves' extract in cherry juice

Sabire Yerlikaya *, Sefa Topuz

Karamanoğlu Mehmetbey University, Engineering Faculty, Food Engineering Department, Karaman, Turkey

Abstract

In this research, *Aspergillus niger* inhibition with ethanol and methanol extracts of apricot leaves in cherry juice was investigated. *Aspergillus niger* concentration 3.5 log cfu/mL is determined in control cample (ju). Ethanolic (air-dried, microwave-dried) and methanolic (air-dried, microwave-dried) extracts (1 mL) are added to cherry juice (9 mL), separately. They were left for incubation at 25°C for 3 minutes. Then *Aspergillus niger* (1 mL) is put into test tubes on extracts and left for incubation at 25°C for 24 h. All extracts significantly reduced *Aspergillus niger* numbers in cherry juice compared to control samples. The highest inhibitory activity was detected in the sample extracted with methanol from microwave-dried apricot leaves (2.94 log cfu/mL). The effect of apricot leaves' ethanol extract was found to be higher than methanol extract, except the samples dried in microwave. The reason for this might be that the phenolic compounds in apricot leaves are more soluble in ethanol than in methanol when they dried in air. Additionally, the heat applied in the microwave might have damaged the phenolic compounds found in apricot leaves. These results demonstrated that apricot leaves can be used for decrease *Aspergillus niger* in cherry juice at 25°C.

Keywords: ethanol; mold; methanol; microwave drying; air drying

1. Introduction

The antimicrobial activities of plant by-product extracts and derivatives have been investigated for several years. However, it appears that the resistance of microorganisms has increased. In this case, due to the increasing concerns of consumers, more studies are needed to eliminate pathogenic microorganisms and develop alternative strategies. Studies on the use of extracts of various plant parts for this purpose have increased [1].

Apricot (*Prunus armeniaca* L.) belongs to the *Prunus* genus of the Rosaceae family of the Rosales order [2]. Apricots grown in Turkey have a lot of diversity and differ from apricots produced in other countries in terms of color, flavor, sweetness and acidity [3]. Apricot is a fruit consumed all year round as fresh, dried and canned [4,5].

Apricot contains high amounts of sugar, starch, protein, pectin, pectose cellulose, organic substances, various vitamins, folic acid, small amounts of K_2O, P_2O_5, CO_2, smaller amounts of Na_2O, CaO, MgO, Fe_2O_3 and trace amounts of Zn and contains trace amounts of Zn, and Cu. Apricot is very rich in minerals potassium and vitamin B carotene [6].

Aspergillus spp. are one of the most common fungus species found in nature, air and soil with saprophytic properties. It can easily contaminate especially dried and stored foods. It has more than 150 species that are ecologically and medically important [7]. This mold infects food before it is harvested, during and after harvest, during transportation and storage, and shortens its shelf life. On the other hand, they cause serious health problems by producing mycotoxins [8,9].

Aspergillus niger emerges as a problem in food businesses. It develops minimum 6-8˚C, optimum 35-37˚C and maximum at 45-47˚C. It is a xerophilic mold and it has been stated that it can grow at an a_w value of 0.77. It also grows below pH 2 in environments with higher water activity than this value [10].

In this research, it is aimed inhibition a strong pathogen *Aspergillus niger* with different extracts

* Corresponding author: sabirebattal@kmu.edu.tr

(ethanol, methanol; air dried, microwave dried) from apricot leaves at 25°C.

2. Materials and Method

2.1. Materials

Apricot (*Prunus armeniaca* L. *avium*) leaves were collected from Karaman in June 2023. 50 g apricot leaves were dried at 13 W/g (650 W) microwave power densities for 210-270 s in the microwave (M) drying process. Then leaves were dried on a clean surface at room temperature for one week in the air drying process (A). The dried leaves were ground with a commercial blender and stored at -18 °C until extraction [11]. *Aspergillus niger* strain was isolated within the scope of the project previously carried out in our laboratory.

2.2. Methods

2.2.1. Production of the extracts

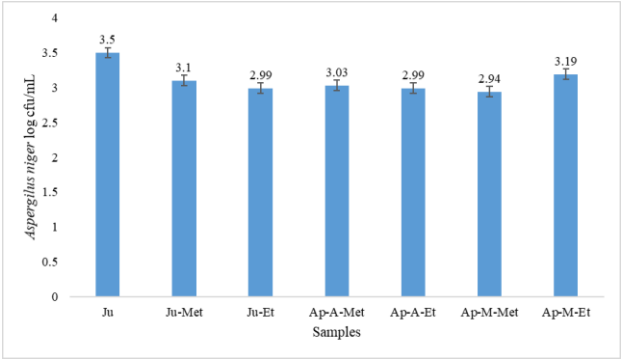
Methanol (Met) and ethanol (Et) extraction of apricot leaves was carried out according to the method Özpınar et al. [12]. 100 mL of methanol was added to 20 g of ground leaves in Met extraction. 100 mL of ethanol was added to 20 g of ground leaves in Et extraction. They were kept in a shaking water bath set at 25°C and 150 RPM for 24 hours. The extracts were centrifuged at 4000 RPM for 10 minutes and the filtrate was obtained by passing the upper part through Whatman 1. The obtained filtrates were stored at -18 °C until they were used.

2.2.2. Aspergillus niger inhibition

Aspergillus niger was used in this study. Mold strains from stock cultures were activated in Nutrient Broth (Merck, Darmstadt, Germany) at 25°C for 48 h. Concentration 3.5 log cfu/mL is selected. Extracts (1 mL) are added to juice (9 mL), separately. They were left for incubation at 25°C for 3 minutes. Then *Aspergillus niger* (1 mL) is put into test tubes on extracts and left for incubation at 25°C for 24 h. Appropriate dilutions were inoculated on petri dishes with Patato Dextrose (PDA) Agar (with tartaric acid) using spread plate technique. It was incubated at 25°C for 5 days [13]. Results were calculated as log cfu/mL.

3. Results and Discussion

Figure 1 demonstrated all extracts significantly reduced *Aspergillus niger* numbers in juice compared to control samples (Ju).



(Ju: juice; Ju-Met: juice + mehanolic extracts of apricot leaves; Ju-Et: juice + ethanolic extracts; Ap-A-Met: juice + air dried methanolic extract; Ap-A-Et: juice + air dried ethanolic extract; Ap-M-Met: juice + microwave dried methanolic extract; Ap-M-Et: juice + microwave dried ethanolic extract)

Figure 1. Inhibition effect of apricot' extracts on *Aspergillus niger* in cherry juice

Aspergillus niger was cultured in cherry juice as 3.5 log cfu/mL. The highest inhibitory activity was detected in the sample extracted with methanol from microwave-dried apricot leaves (2.94 log cfu/mL). Figure 1 shows the antifungal effect was the same in the sample extracted with ethanol (Ju-Et) and in the sample extracted with ethanol (Ap-A-Et) from apricot leaves dried in the air (2.99 log cfu/mL). The lowest activity was detected in sample extracted with ethanol from microwave-dried apricot leaves (3.19 log cfu/mL). The effect of apricot leaves' ethanol extract was found to be higher than methanol extract, except the samples dried in microwave. The reason for this might be that the phenolic compounds in apricot leaves are more soluble in ethanol than in methanol when they dried in air. Phenolic compounds dissolved in ethanol might have been adversely affected by microwave heat. Therefore, the result obtained might have been high. The temperature of the apricot leaves in the microwave can be reduced and the time can be extended. In this case, the phenolic compounds will not be damaged and a slightly higher antifungal effect might be observed.

Gültekin [1] determined that apricot oil has inhibitory activity on bacteria such as *Escherichia coli*, *Pseudomonas aeruginosa* and *Staphylococcus aureus*. In another study, it was determined that apricot oil had an antibacterial effect on *E. coli O157:H7* and *Salmonella typhimurium*, which are Gram-negative bacteria [14]. In a study conducted in Pakistan, it was determined that butanoic apricot extracts showed inhibitory activity on 20 Gram-

positive and 13 Gram-negative bacteria [15]. It was determined that the methanol extract obtained from apricot kernels was also significantly effective against *Candida albicans* [16]. Alan et al. [5] stated that ethanolic apricot extracts had an antimicrobial effect on *Klebsiella pneumoniae, Escherichia coli, Streptococcus faecalis, Staphylococcus aureus, Bacillus megaterium, Enterococcus faecalis.*

4. Conclusion

Cherry juice is among the potential foods in terms of mold growth due to their low pH value. *Aspergillus niger* is one of risky molds. It is possible to come across various studies in the literature on the antimicrobial effects of various plant by-products. For this purpose, in this study, the antifungal effect of apricot leaf extracts was examined. It was observed that ethanolic extracts were more effective in air-dried samples and methanolic extracts were more effective in microwave-dried samples. In studies, the effects of different plant extracts, especially on different molds, should be examined when setting up various experiments. Because molds pose a greater risk than bacteria and yeast in acidic foods such as cherry juice. At this stage, when setting up the experiment, the aim should be to correctly select plant by-products and concentrations that can be used instead of chemical preservatives.

The results of this study show that as a natural food preservative apricot leaf' extracts (methanolic and ethanolic) can be used to effectively reduce the *Aspergillus niger* population in cherry juice.

Compliance with Ethics Requirements. Authors declare that they respect the journal's ethics requirements. Authors declare that they have no conflict of interest and all procedures involving human / or animal subjects (if exist) respect the specific regulation and standards.

Disclosure statement. No potential conflict of interest was reported by the authors.

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