

## Detection of Pathogen *Candida* spp. Isolated from Butter

Tereyağında Patojen *Candida* spp. Varlığının Araştırılması

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**Abstract:** Yeasts may affect food safety and quality causing spoilage in foods. Also, yeasts can be used as starter culture in the production of traditional and industrial products. But, *Candida* species are important for hospital infections which have been able to infect to humans via food in recent years. The aim of this study was to evaluate the incidence of pathogen *Candida* spp. in butter. In this study, 100 butter samples were analyzed from public bazaars. *Candida* spp. was detected 10 % of butter samples. *C. albicans*, *C. albicans* and *C. krusei*, *C. tropicalis*, *C. krusei* were isolated 4%, 3%, 2%, 1% from positive butter samples for *Candida* spp., respectively. According to this data, presence of pathogen *Candida* spp. in butter samples can cause significant problems for public health. In order to ensure food safety, it is necessary to determine the rate of yeast and mold and the detection of pathogen yeasts in microbiological analyses.

**Keywords:** Butter, *Candida* spp., public health, yeast and mold

**Öz:** Mayalar, gıdalarda bozulmalara sebep olarak gıda güvenliği ve kalitesini etkileyebilir. Ayrıca mayalar geleneksel ve endüstriyel ürünlerin üretiminde starter kültür olarak da kullanılabilir. Ancak, son yıllarda *Candida* türleri gıda yoluyla insanlara bulaşabilen hastane enfeksiyonlarına da neden olmaktadır. Bu çalışmada, tereyağında patojen *Candida* spp. varlığının araştırılması amaçlanmıştır. Halk pazarlarından toplanan toplam 100 adet tereyağı örneği analiz edildi ve bu örneklerin % 10'u *Candida* spp. pozitif olarak tespit edildi. Tereyağından izole edilen *Candida* spp. pozitif izolatlarda *C. albicans*, *C. albicans* ve *C. krusei*, *C. tropicalis*, *C. krusei* varlığı sırasıyla % 4 % 3, % 2, % 1 olarak bulundu. Patojen *Candida* spp.'nin tereyağ örneklerinde varlığı halk sağlığı açısından önemli problemler meydana getirebilir. Mikrobiyolojik analizlerde güvenli gıda üretiminin sağlanması amacıyla maya ve küf oranı ile birlikte patojen mayaların da tespiti gereklidir.

**Anahtar Kelimeler:** *Candida* spp., halk sağlığı, maya ve küf, tereyağ

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## Introduction

Yeasts are spoilage microorganisms that affect the quality and safety of a wide range of foods (Betts et al., 1999). Yeasts are used traditionally in bread, beer and wine production. In addition, yeasts are used as starter culture during to ripening periods of the cheeses in order to give some special characterical properties (Loretan et al., 1998). The genus *Candida* are commensal eukaryotic yeast species of phylum Ascomycota group member

and can be found in the environment, human and other mammals (McManus and Coleman, 2014). In mammals, *Candida* species are the member of normal commensal mucosal surfaces of gastrointestinal and genitourinary tracts (Kumamoto, 2011). In addition, yeasts can adversely affect food safety and cause infections as an opportunistic pathogen (Fleet, 2007). More than 17 species of *Candida* can cause human

infections. Besides, *Candida albicans*, *Candida glabrata*, *Candida parapsilosis*, *Candida tropicalis*, and *Candida krusei* are the aetiological agents of invasive infections (Pfaller et al., 2007). *C. albicans* is the main reason of the oral and systemic candidiasis (Akpan and Morgan, 2002; Thompson et al., 2010).

Butter is a dairy product which is made of milk or cream (El-Diasty and Salem, 2009). Butter is highly nutritive and beneficial for the consumers (Kwak, H. S., Ganesan, P., & Al Mijan, 2013). The microbial quality in butter may be affected by the processing methods, storage conditions and packaging (Karagözlü and Ergönül, 2008). *Candida* species can affect the foods as starter cultures and spoilage microorganisms (Hommel, 2014). There are numerous reports on the occurrence of pathogenic yeasts in dairy products (El-Sharoud et al., 2009; Sagdic et al., 2010; Wanderley and Andréia, 2013; Mohamed et al., 2017). Pathogen *Candida* spp. is a problem in human medicine. In veterinary medicine, *Candida* spp. have been isolated as a cause of mastitis (Crawshaw et al., 2005). The consume of contaminated milk without heat treatment or dairy products may create the risk of *Candida* spp. (McManus and Coleman, 2014). The presence of pathogen *Candida* species in foods can cause infections to human. The aim of the study was to evaluate the incidence of pathogen *Candida* spp. in butter.

## Material and Methods

### Sampling

In this study, one hundred butter samples were collected between October 2016 and December 2017 from public bazaar in Burdur. Butter samples were transported to the laboratory under refrigeration and aseptic conditions. Samples were investigated for the presence of *Candida* spp. Butter (10 g) samples were diluted with 90 mL of 0.1% peptone water and homogenized for 2 minutes with a Labblender 400 stomacher (Seward Laboratory, London, UK) for the enumeration of *Candida* spp. Serial dilutions were

prepared with 9 mL sterile peptone water and 0.1 mL of each dilution was spreaded on agars. Acidified potato dextrose agar (PDA) was incubated at 25°C for 5-7 days for enumeration of yeasts and molds (Koburger and Marth, 1984; Tournas et al., 2001). CHROMagar *Candida* (CHROMagar *Candida* Company, Paris, France) was prepared according to the instructions of manufacturer. All plates were incubated at 30°C for 48 h aerobically, as recommended by the manufacturer (Pfaller et al., 1996). The appearance of colonies, including color, size, and textures on CHROMagar *Candida*, was analyzed. The color of colonies on CHROMagar *Candida* was similar as given by the manufacturer, green colonies of *C. albicans*, metallic blue colonies of *C. tropicalis* and by purple colored colonies of *C. krusei*.

### Reference strains used in testing

ATCC 97012 *C. albicans*, ATCC 2011 *C. tropicalis*, ATCC 610 *C. krusei* strains were used in this study.

### Other tests

Several tests were applied to the suspicious colonies for the isolation of *Candida* spp. as Gram staining, germ tube test, carbohydrate fermentation tests (glucose, maltose, sucrose, and galactose), and urease tests (Cooper and Margarita, 1985; Konemann et al., 1997).

## Results and Discussion

One hundred butter samples were evaluated for the existence of pathogen *Candida* spp. in this study. *Candida* spp. was detected 10 % of butter samples. *C. albicans*, *C. albicans* and *C. krusei*, *C. krusei*, *C. tropicalis* were isolated 4%, 3%, 2%, 1% from *Candida* spp. positive butter samples, respectively. Moreover yeast and mold counts of 100 butter samples were detected ranged from min. 2.00 log cfu/g to max. 4.30 log cfu/g and average 2.68±0.79 log cfu/g. El-Diasty and Salem (2009) studied on lipolytic and proteolytic fungi in dairy products and they reported that

10% of the butter samples contaminated with *C. tropicalis*.

In this study, pathogenic *Candida* spp. were isolated from butter samples. The microflora of the butter reflects the qualities of the cream, the sanitary conditions of the equipment used to produce the butter, the environmental and hygienic conditions during the packaging and transport of the butter are important factors effecting butter quality (Pal, 2014). Previous studies were reported higher levels of molds and yeasts contamination in butter as  $1.7 \times 10^4$ ,  $9.0 \times 10^5$ ,  $5.5 \times 10^6$ , and  $6.99 \times 10^4$  kob/g by Yalçın et al. (1993), Patır et al. (1995), Sancak et al. (2002) and Henin and Kalves (1992), respectively. Also, Bakirci et al. (2000) were analysed the microbiological properties of 33 culinary types of butter samples, and as a result of the study yeast and molds were found as 2.12 cfu/g in family businesses and 5.25 cfu/g in dairy farm. In another study Hayaloglu and Konar (2001) were reported that enumeration of yeast and mold of 25 butter samples as  $1.0 \times 10^3$  -  $7.3 \times 10^6$  cfu/g in Malatya region. Karagozlu and Ergonul (2008) were observed the counts of yeast and mould in butter as  $< 1.0$ - $6.66$  log cfu/g. In our study, yeast and mold counts were detected as minimum 2.00 cfu/g, maximum 4.30 cfu/g, and mean  $2.68 \pm 0.79$  cfu/g. In our study, results were lower than previous studies.

Although there are many studies on hygiene and presence of pathogenic microorganisms in butter, it seems that there are just a few studies on the analysis of the pathogen *Candida* spp. Total number of yeast and molds does not refer to pathogenic *Candida* spp in microbiological analysis of foods. Pathogen *Candida* spp. constitutes major health problems in humans by developing resistance and it can cause diseases by taking contaminant foods (Wanderley and Andréia, 2013). Chromogenic media is effective for the isolation and identification of pathogen *Candida* spp. (Devi and Maheshwari, 2014).

Finally it could be said, microbiological analysis of food samples should be made not just for

determining the total number of yeasts and molds, but the samples should also be tested for detecting the presence of pathogenic yeast, which would be very crucial for the public health. We suggest that to be aware of the presence of pathogenic *Candida* spp. in foods, relevant legislation should be regulated to decrease the possible risk of pathogenic *Candida* spp.

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