# BÖLÜM 5

# FERMENTE ÜRÜNLERDE GIDA GÜVENLİĞİ

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## 1. Giriş

Fermantasyon, mikroorganizmaların katılımıyla gıdaları korumak için eski zamanlardan beri uygulanmaktadır (1). Bu terim, "pişirmek" anlamına gelen Latince fervere kelimesinden türetilmiştir. Mikroorganizmaların etki mekanizması, Omega-3 yağ asitleri, B vitaminleri ve mineraller gibi çeşitli avantajlı katabolit formlarının oluşumu ile birlikte, karmaşık karbonhidrat bileşiklerinin ve diğer makromoleküllerin daha basit olanlara parçalanmasına dayanır (2). Fermente gıdalar, insan sağlığında önemli bir rol oynayan ve gıda işleme ve saklamanın en eski yaygın yolu olmaya devam eden yararlı mikroorganizmalar için araç görevi görür. Geleneksel fermente gıdalar, beslenmeleri ve gıda güvenliği açısından neredeyse tüm dünyada popülerdir. Et ürünlerini, süt ürünlerini, tahılları ve sebzeleri muhafaza etme yöntemleri birçok ülkede oldukça gelişmiştir. Fermente gıdalar, geliştirilmiş besin içeriği, mikrobiyal stabilite, sindirilebilirlik ve detoksifikasyon yoluyla faydalar sağlamaktadır (3).

Tahıllar gibi bitkisel kaynaklı, et ve süt ürünleri gibi hayvansal kaynaklı çeşitli tek veya karışık hammaddeler fermente edilebilir. Fermente gıdalar, küçük ölçekte (evsel) ve büyük ölçekte (endüstriyel) olabilen işlenmiş gıdaları içerir. Bazı coğrafi

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Türkiye'nin Trakya bölgesinde eski çağlardan beri üretilmekte ve tüketilmektedir, ancak bu gelenek her geçen gün ortadan kalkmaktadır (93). Hardaliye'nin LAB florası nedeniyle süt ürünü olmayan probiyotik içecek olarak sınıflandırılmaktadır (94). Hardaliye'nin antioksidan özellikleri ile plazma malondialdehit, dienokonjugat ve homosistein düzeylerini azalttığı gösterilmiştir (95).

Boza, arpa, mısır, pirinç, yulaf ve darı gibi çeşitli tahılların fermantasyonundan elde edilen geleneksel bir Türk alkolsüz içeceğidir ve genellikle kış ve sonbaharda tüketilir (96). Boza, bakteriyosinler üreten LAB ve maya gibi farklı mikroorganizmalar kullanılarak fermente edilir. Boza fermantasyonu, $CO_2$ ve laktik asit üreten hem laktik asit hem de alkol fermantasyonunu içerir (97, 87).

## 4. Sonuç

Fermente gıdalar, dünyanın gelişmekte olan ülkelerinden gelen insanlar için önemli besin kaynaklarıdır. Fermantasyon işleminin, pH düşüşü nedeniyle ürünün kalitesini ve güvenliğini sağlayabileceği iyi bilinmektedir. Literatür bilgisine göre, fermente gıdaların yetersiz beslenme, hammaddelerin yanlış hazırlanması, işlem sonrası kontaminasyon veya pH'ı düşürmek için etkisiz fermantasyon ile mücadele etmek ve azaltmak için önemini ortaya koymaktadır. Fizikokimyasal özellikleri de dahil olmak üzere farklı fermente gıda ürünleri ile bağlantılı fermantasyon mikrobiyotası kurulmuştur. Araştırmacılar, az gelişmiş veya az gelişmiş ülkelerde hijyen koşullarını, gıda kalitesini ve güvenliğini sürdürmek için uygun ve ekonomik koşullar oluşturmuşlardır. Bununla birlikte, hammaddelerin kalitesini artırmak ve endüstriyel büyüme için gıda güvenliği yönetimi yaklaşımlarının dahil edilmesi için gelecekteki araştırmaların yapılması gerekmektedir.

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