

**In-depth microbial analysis of Sant'Agostino table olives flavored with wild fennel  
(*Foeniculum vulgare* Mill., 1768)**

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This study explores the microbial ecology of Sant'Agostino green table olives, a traditional Apulian product flavored with wild fennel (*Foeniculum vulgare*), using a polyphasic approach that integrates culture-dependent and culture-independent methods. The olives underwent spontaneous fermentation, and both fruit and brine samples were analyzed to characterize cultivable and non-cultivable microbial populations. Microbial enumeration revealed lactic acid bacteria (LAB) and yeasts as the dominant groups. LAB levels reached 7.3 Log CFU/g in fruit and 6.4 Log CFU/mL in brine, while yeast populations were higher in brine (5.6–5.9 Log CFU/mL) than in fruit (4.5–4.9 Log CFU/g). *Enterococcus faecium* and *Candida tropicalis* emerged as the most prevalent species. The absence of Enterobacteriaceae, coliforms, *Salmonella* spp., and *Shigella* spp. confirmed the microbiological safety of the product. Spore-forming bacteria, such as *Bacillus velezensis* and *Priestia endophytica*, were detected exclusively in brine at approximately 2.5 Log CFU/mL. Culture-based analysis identified six LAB species, including *Lactiplantibacillus plantarum*, *Lactiplantibacillus pentosus*, and *Leuconostoc mesenteroides* subsp. *cremoris*. High-throughput sequencing of the 16S rRNA gene (V3–V4 region) confirmed the dominance of *Enterococcus* (up to 81.7% relative abundance in brine) and *Leuconostoc* (up to 40.3% in fruit), with *Lactobacillus* present at lower levels (<1%). Alphaproteobacteria were notably abundant in fruit samples, reaching up to 90.1% in one batch. The integrated culture-dependent and culture-independent approach provided a comprehensive overview of microbial diversity, highlighting the potential of selected LAB and yeast strains for enhancing the quality of traditional fermented products. Further studies are needed to specifically assess the technological and functional properties of these strains, with the aim of improving the quality and health-promoting features of Sant'Agostino table olives.

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