



## Effects of Fermentation at Different Temperatures Using Baker's Yeast on the Microbial and Chemical Quality of Fish Diets

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### ABSTRACT

This study addressed the effects of fermentation temperature on the microbial and chemical quality of fish diets fermented with baker's yeast (*Saccharomyces cerevisiae*). Diets containing soybean meal and fish meal were fermented for 24 h at 20, 25, 30, 35, or 37 °C using 2% yeast and 30% moisture, with three independent batches per temperature. Temperature significantly affected most fermentation and microbial variables. A temperature of 30 °C produced the highest crude protein content (36.1%), apparent fermentation efficiency ( $88.3 \pm 2.4\%$ ), ethanol production ( $8.92 \pm 0.31 \text{ mg g}^{-1}$ ), CO<sub>2</sub> production ( $18.3 \pm 0.6 \text{ mL g}^{-1}$ ), viable-cell density ( $6.93 \pm 0.24 \times 10^7 \text{ cells mL}^{-1}$ ), cell survival ( $91.8 \pm 1.8\%$ ), and total aerobic bacterial count ( $6.43 \pm 0.19 \text{ log CFU g}^{-1}$ ). Lactic acid bacteria reached their highest count at 37 °C ( $7.23 \pm 0.27 \text{ log CFU g}^{-1}$ ), while coliform counts declined from 2.45 to 1.41 log CFU g<sup>-1</sup> as temperature increased. pH decreased and titratable acidity increased with temperature, whereas carbohydrate content declined because of substrate utilization. Moisture, crude lipid, and ash were not significantly affected. Overall, 30 °C provided the best balance of fermentation performance, yeast viability, and chemical composition, whereas 37 °C favored acidification and lactic acid bacterial growth. Because pathogen-challenge, storage, and *in vivo* feeding trials were not conducted, the observed changes should not be interpreted as direct evidence of pathogen elimination or improved fish performance.

### INTRODUCTION

Aquaculture is among the fastest-growing food-production sectors worldwide and plays a pivotal role in meeting the increasing global demand for animal protein (Najim & Al-Noor, 2026). However, the continued increase in feed-ingredient prices and the environmental constraints associated with marine protein resources have intensified the search for sustainable alternatives that improve feed efficiency while maintaining fish health (Al-Noor *et al.*, 2023a). Among these alternatives, microbial fermentation has received considerable attention as an effective strategy for improving the nutritional quality and microbiological characteristics of aquafeeds (Jassim *et al.*, 2024). Baker's yeast, *Saccharomyces cerevisiae*, is one of the most widely used microorganisms in the food and feed industries because of its adaptability and well-established fermentative capacity (Rhema & Al-Noor, 2022). Its nutritional value is associated with its high

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