

Abstract

Pak-sian dong is a traditional Thai fermented food made from *Cleome gynandra* (L.) stems and leaves, typically fermented in rice water brine through spontaneous fermentation by indigenous lactic acid bacteria (LAB). While spontaneous fermentation contributes to flavor development and preservation, it often results in inconsistent quality due to microbial and environmental variability. This study aimed to determine the optimal salt concentration for brine in spontaneous fermentation and to evaluate the potential of *Lactiplantibacillus pentosus* 9D3—a GABA-producing strain isolated from *Pak-sian dong*—as a starter culture for controlled fermentation. In the first phase, spontaneous fermentation under varying salt concentrations was assessed for physicochemical and microbial characteristics. A 2% (w/v) salt concentration was found to best support LAB growth, resulting in the lowest pH, highest titratable acidity, and the most favorable sensory evaluation scores. In the second phase, controlled fermentation using *Lactiplantibacillus pentosus* 9D3 was compared to spontaneous fermentation. The controlled fermentation achieved higher LAB counts (10^8 CFU/mL), faster acidification, and improved fermentation efficiency. Notably, the final product from controlled fermentation exhibited significantly higher total phenolic content (TPC), antioxidant activity, and GABA concentration compared to spontaneous fermentation. This further suggests *Lactiplantibacillus pentosus* 9D3 as a functional starter culture to enhance the consistency, nutritional value, and probiotic potential of fermented *Cleome gynandra* (L.).

Keywords: *Cleome gynandra* (L.), controlled fermentation, functional food, GABA, *Lactiplantibacillus pentosus* 9D3, salt, spontaneous fermentation