

ABSTRACT

Tempeh is a traditional Indonesian product made from fermented soybeans. A suboptimal fermentation process can lead to failure in tempeh production. In this study, a design for a temperature, humidity, and time optimization system was created to improve the quality of tempeh fermentation based on fuzzy logic. The main system components include an Arduino UNO R3 microcontroller as a digital signal processor, an ESP32 CAM as a visual data recorder, and fuzzy logic. The tempeh fermentation control and quality control system program is run using fuzzy logic. Temperature and humidity are controlled by the system according to the expected setpoints. The quality of tempeh fermentation is based on changes in tempeh mass. Changes in tempeh mass are observed using an HX711 loadcell sensor. The implementation system uses two soybean samples with the same conditions from the Home Industry Tempeh Super Bina Selaras. The first sample serves as a control sample, while the second sample is treated with a control system during the fermentation process. Measurements of soybean samples are analyzed to determine the best fermentation conditions. The results show that the mycelium sample with the treatment begins to grow after 20 hours of fermentation, while the control sample only begins to grow after 27 hours. After 51 hours of fermentation, the mass shrinkage of the treated sample was 7.99 g and the control sample was 5.51 g. The large difference in mass shrinkage indicates optimal fermentation activity. Calculations using the Mamdani fuzzy method confirmed that the quality of the tempeh fermentation under the control was categorized as good. Thus, the fuzzy logic-based tempeh fermentation control and quality determination system is effective in improving the efficiency and quality of tempeh fermentation.

Keywords: *Tempeh fermentation, Fuzzy logic, Tempeh quality, Temperature and humidity kontrol, Automatic kontrol system.*