ABSTRAK

SISTEM DETEKSI ALKOHOL DAN PH DALAM PRODUK FERMENTASI UNTUK KEAMANAN PANGAN DAN KONTROL KUALITAS BERBASIS *INTERNET OF THINGS*

(2025 : xv + 58 halaman + 18 gambar + 11 tabel + 9 lampiran)

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Keamanan pangan menjadi aspek krusial dalam pengawasan produk fermentasi, terutama dalam memantau kandungan alkohol dan tingkat keasaman (pH). Penelitian ini merancang dan mengimplementasikan sistem deteksi kandungan alkohol dan pH berbasis *Internet of Things* (IoT) menggunakan sensor MQ-3 dan sensor pH analog yang dikendalikan oleh mikrokontroler ESP32. Sistem ini menampilkan hasil pembacaan sensor secara *real-time* melalui LCD dan aplikasi *Blynk*. Kalibrasi awal dilakukan dengan metode regresi polinomial untuk mengukur akurasi, namun pendekatan utama konversi tegangan ke nilai PPM didasarkan pada rumus linier hasil uji dua sampel kecap asin beralkohol dan non-alkohol yang telah memiliki izin edar BPOM RI. Ambang batas alkohol ditetapkan sebesar 10300 ppm. Delapan sampel produk fermentasi diuji, termasuk cuka apel, yoghurt, yakult, tempoyak, tape, kimchi, dan kecap asin. Hasil pengujian menunjukkan sistem mampu mengidentifikasi produk yang melebihi batas kandungan alkohol serta mendeteksi status pH secara akurat. Sistem ini berpotensi dikembangkan sebagai alat skrining awal dalam pengawasan keamanan pangan secara cepat dan efisien.

Kata Kunci : Alkohol, *Blynk*, ESP32, Fermentasi, IoT, Keamanan Pangan, MQ-3, pH

ABSTRACT

ALCOHOL AND PH DETECTION SYSTEM IN FERMENTED PRODUCTS FOR FOOD SAFETY AND QUALITY CONTROL BASED ON INTERNET OF THINGS

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Food safety is a crucial aspect in monitoring fermented products, particularly in assessing alcohol content and acidity level (pH). This research developed an Internet of Things (IoT)-based detection system using an MQ-3 alcohol sensor and an analog pH sensor, controlled by an ESP32 microcontroller. The system displays real-time sensor readings through an LCD and the Blynk application. Initial calibration was conducted using polynomial regression to evaluate accuracy, while the main voltage-to-PPM conversion method was based on a linear formula derived from two soy sauce samples (alcoholic and non-alcoholic), both certified by Indonesia's BPOM. An alcohol threshold of 10300 ppm was established. Eight fermented product samples were tested, including apple vinegar, yogurt, yakult, tempoyak, tape, kimchi, and soy sauce. Results showed the system successfully identified samples exceeding the alcohol threshold and accurately classified pH status. This system demonstrates potential as a rapid, low-cost screening tool for ensuring food safety in fermented products.

***Keywords**: Alcohol, Blynk, ESP32, Fermentation, Food Safety, IoT, MQ-3, pH*