

RANCANG BANGUN SISTEM PENGUKUR KELAYAKAN DAN KELEZATAN MAKANAN POKOK INDONESIA BERDASARKAN PENGUJIAN FISIK MENGGUNAKAN E-TONGUE

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INTISARI

Penelitian ini berfokus pada rancang bangun sistem *electronic tongue* (E-Tongue) untuk pengukuran kelayakan dan kelezatan makanan pokok Indonesia (nasi, ayam, sayur, dan telur) secara objektif dan efisien. Kebutuhan akan sistem ini muncul karena metode uji sensorik konvensional kurang efisien dan subjektif. E-Tongue dikembangkan untuk mengatasi keterbatasan ini dengan mengintegrasikan pengukuran pH dan *Electrical Conductivity* (EC).

Sistem E-Tongue dirancang menggunakan sensor RS-485 yang dihubungkan ke mikroprosesor PSoC 5LP. Sistem diuji dan mampu mengukur dengan valid dalam rentang pH 3,9–9,0 dan EC 0–20.000 $\mu\text{S}/\text{cm}$. Pengambilan data dilakukan secara berkala dalam durasi 7,25 jam pada 5 sampel makanan pokok di bawah variasi kondisi penyimpanan terbuka dan tertutup. Evaluasi kelezatan diperoleh melalui analisis Korelasi Pearson (r) antara nilai pH terukur oleh E-Tongue dan skor kelezatan yang diberikan oleh panelis manusia.

Pengujian menunjukkan bahwa semua sampel makanan kombinasi tanpa telur yang diuji masuk dalam kategori Layak berdasarkan kriteria pH yang ditetapkan (5,7–6,6). Analisis Korelasi Pearson menghasilkan nilai $r = 0,87$ dan p -value sebesar 0,023, membuktikan adanya korelasi kuat antara pH dan Kelezatan. Dengan Koefisien Determinasi (R^2) sebesar 0,76, sistem E-Tongue divalidasi telah memenuhi tujuan perancangan dan terbukti mampu mengukur dan memprediksi kelezatan secara objektif, sehingga layak digunakan sebagai alat kendali mutu pangan.

Kata kunci: *e-tongue, kelayakan makanan, kelezatan makanan, pH, electrical conductivity*

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DESIGN AND DEVELOPMENT OF AN E-TONGUE SYSTEM FOR MEASURING THE FOOD QUALITY AND TASTE OF INDONESIAN STAPLE FOODS

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ABSTRACT

This research focuses on the design and development of an electronic tongue (E-Tongue) System for the objective and efficient measurement of quality and taste in Indonesian staple foods (rice, chicken, vegetables, and eggs). The necessity for this system stems from the limitations of conventional sensory testing methods, which are often inefficient and subjective. The E-Tongue was developed to overcome these drawbacks by integrating the measurement of pH and electrical conductivity (EC).

The E-Tongue system utilizes an RS-485 sensor connected to a PSoC 5LP microcontroller. The system has a reliable measurement range of pH 3,9–9,0 and EC 0–20.000 $\mu\text{S}/\text{cm}$. Data acquisition was conducted periodically over a total duration of 435 minutes on five staple food samples under both open and closed storage condition variations. Taste was assessed through Pearson's Correlation analysis between the pH values measured by the E-Tongue and the corresponding subjective scores provided by human panelists.

The results indicated that all combination food samples, excluding eggs, met the established criteria based on the reference pH range (5,7–6,6). The Pearson's Correlation analysis yielded an r value of 0,87 with a p -value of 0,023, confirming a strong correlation between pH and Taste quality. With a Coefficient of Determination (R^2) of 0,76, the E-Tongue system is validated, having met its design objectives and proven its capability to objectively measure taste, making it suitable for use as an efficient food quality control tool.

Keywords: *e-tongue, feasibility, taste quality, pH, electrical conductivity*

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