ABSTRAK

Peralatan laboratorium yang terjangkau sangat penting untuk pengembangan dan pemanfaatan ilmu secara berkelanjutan. Penelitian ini menyajikan pengembangan spektrofotometer sederhana yang terjangkau untuk mengukur kadar protein dengan metode Lowry. Penelitian ini bertujuan untuk mengetahui potensi dan validasi spektrofotometer sederhana menggunakan LED, sensor cahaya dan mikrokontroler untuk penentuan kadar protein dengan metode Lowry. Perancangan spektrofotometer ini menggunakan komponen mikrokontroler Arduino, sensor cahaya TSL2591, LED 750 nm sebagai sumber cahaya, rumah komponen dan tempat kuvet dirancang dengan *software* 3D dan dicetak dengan printer cetak 3D menggunakan filament PLA (*Polylactic Acid*). Spektrofotometer selanjutnya diuji dan divalidasi meliputi kinerja alat, uji validasi (linearitas, LOD dan LOQ, rentang metode, presisi, presisi antara, akurasi), dan penentuan kadar protein dalam sampel susu kambing. Hasil pengujian dengan spektrofotometer sederhana menunjukkan rentang linear 100 – 700 ppm, dengan nilai koefisien korelasi (r) 0,9995; batas deteksi (LOD) 56,751 ppm; nilai batas kuantifikasi 189,170 ppm; nilai batas bawah (LOQ) 189,170 ppm dan nilai batas atas 734,100 ppm; presisi dengan nilai HORRAT 0,831; presisi antara dengan nilai HORRAT 0,820; akurasi dengan nilai rata-rata persen perolehan kembali (%*Recovery*) 102%; kadar protein dalam sampel susu kambing 415,100 ppm.

Kata kunci : analisis protein, metode Lowry, spektrofotometer sederhana

ABSTRACT

Affordable laboratory equipment is essential for the sustainable development and utilization of science. This research presents the development of a simple, affordable spectrophotometer to measure protein levels using the Lowry method. The research aims to determine the potential and validate a simple spectrophotometer using LEDs, light sensors, and microcontrollers for determining protein levels by the Lowry method. The design of this spectrophotometer incorporates Arduino microcontroller components, a TSL2591 light sensor, a 750 nm LED as a light source, component housing, and a cuvette holder designed with 3D software and printed with a 3D printer using PLA (Polylactic Acid) filament. The spectrophotometer was then tested and validated, including tool performance and validation tests (linearity, LOD, and LOQ, method range, precision, intermediate precision, accuracy), as well as the determination of protein levels in goat milk samples. The test results with the simple spectrophotometer showed a linear range of 100 - 700 ppm, with a correlation coefficient (r) value of 0.9995; a limit of detection (LOD) of 56.751 ppm; a limit of quantification (LOQ) of 189.170 ppm; a lower limit value of 189.170 ppm and an upper limit value of 734.100 ppm; precision with a HORRAT value of 0.831; intermediate precision with a HORRAT value of 0.820; and accuracy with an average percent recovery value of 102%. The protein content in goat milk samples was determined to be 415.100 ppm.

Keywords: Lowry method, protein analysis, simple spectrophotometer