

VALIDASI METODE KOLORIMETRI BERBASIS CITRA DIGITAL UNTUK ANALISIS NITRIT DALAM PRODUK DAGING OLAHAN MENGUNAKAN FILM REAGEN GRIESS-PULLULAN

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INTISARI

Validasi metode kolorimetri berbasis citra digital untuk analisis nitrit dalam produk daging olahan telah dilakukan dengan menggunakan film reagen Griess-pullulan. Analisis nitrit didasarkan pada reaksi ion nitrit dengan film sulfanilamida membentuk ion benzenediazonium yang selanjutnya mengalami reaksi kopling dengan film N-(1-naftil)etilendiamina menghasilkan senyawa azo berwarna merah muda. Tahapan penelitian meliputi pembuatan dan pengujian stabilitas film reagen, optimasi kondisi analisis, serta validasi metode berdasarkan parameter linearitas, batas deteksi (LoD), batas kuantifikasi (LoQ), ketelitian, dan ketepatan, serta perbandingan metode dengan spektrofotometri UV-Vis menggunakan uji t berpasangan.

Film reagen menunjukkan kestabilan yang baik hingga minggu ke-8 dengan nilai *retained activity* sebesar 96–110%. Hasil validasi menunjukkan bahwa metode kolorimetri pada kanal hijau memiliki linearitas yang sangat baik dengan nilai R^2 sebesar 0,9996, sedangkan metode spektrofotometri UV-Vis memiliki nilai R^2 sebesar 0,9994. Metode kolorimetri memiliki nilai LoD dan LoQ masing-masing sebesar 0,0033 dan 0,0100 mg L⁻¹, serta menunjukkan presisi dan akurasi yang baik dengan rentang nilai masing-masing sebesar 0,20–9,37% dan 82–92%. Hasil uji t berpasangan menunjukkan tidak terdapat perbedaan yang signifikan antara kedua metode pada sampel sosis dan ham. Uji interferensi menunjukkan bahwa ion sulfat, L-sistein, dan asam askorbat memberikan interferensi signifikan. Metode kolorimetri berbasis citra digital menunjukkan kinerja yang sedikit lebih baik dibandingkan metode spektrofotometri UV-Vis pada beberapa parameter validasi. Hasil analisis kadar nitrit pada sampel sosis, kornet, dan ham berkisar antara 0,313–0,845 mg kg⁻¹.

Kata kunci: citra digital, kolorimetri, nitrit, reaksi Griess.

***VALIDATION OF DIGITAL IMAGE-BASED COLORIMETRIC METHOD
FOR NITRITE ANALYSIS IN PROCESSED MEAT PRODUCTS USING
GRIESS-PULLULAN REAGENT FILM***

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ABSTRACT

The validation of a digital image-based colorimetric method for nitrite analysis in processed meat products was carried out using a Griess–pullulan reagent film. The analytical principle relies on the reaction of nitrite ions with sulfanilamide within the film to form a benzenediazonium ion, which subsequently undergoes a coupling reaction with N-(1-naphthyl)ethylenediamine to produce a pink azo compound. The study involved the preparation and stability testing of the reagent film, optimization of analytical conditions, and method validation based on linearity, limit of detection (LoD), limit of quantification (LoQ), precision, and accuracy. Furthermore, the method was compared with UV–Vis spectrophotometry using a paired t-test.

The reagent film demonstrated good stability up to 8 weeks, with retained activity values ranging from 96–110%. The validation results showed that the colorimetric method in the green channel exhibited excellent linearity with an R^2 value of 0.9996, while the UV-Vis spectrophotometric method had an R^2 value of 0.9994. The colorimetric method had LoD and LoQ values of 0.0033 and 0.0100 mg L⁻¹ respectively, and demonstrated good precision and accuracy with ranges of 0.20–9.37% and 82–92% respectively. Paired t-test results indicated no significant difference between the two methods for sausage and ham samples. Interference tests revealed that sulfite ions, L-cysteine, and ascorbic acid significantly affected the analysis. Overall, the digital image-based colorimetric method demonstrated slightly better performance than UV–Vis spectrophotometry in several validation parameters. Nitrite concentrations detected in sausage, corned beef, and ham ranged from 0.313–0.845 mg kg⁻¹.

Keywords: digital image, colorimetry, nitrite, Griess reaction.