INTISARI

PENGEMBANGAN ANALISIS BORON SECARA SPEKTROFOTOMETRI UV-VIS MELALUI MODIFIKASI SISTEM DISTILASI ESTER BORAT KE DALAM KURKUMIN

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Analisis boron secara spektrofotometri UV-Vis telah dikembangkan melalui modifikasi sistem distilasi ester borat ke dalam kurkumin. Modifikasi dilakukan untuk meningkatkan sensitivitas dan selektivitas metode analisis boron dalam matriks yang kompleks. Boron dipisahkan melalui distilasi setelah dibentuk sebagai trietil borat dan direaksikan dengan kurkumin. Reaksi esterifikasi dilakukan dalam wadah teflon dengan menggunakan pelarut etanol dan katalis H_2SO_4 2,5% (b/b). Sistem distilasi mencapai optimum pada suhu 25 ^oC selama 24 jam, suhu 75 ^oC selama 4 jam, pH 5-6, rasio etanol/asam borat 5:1, rasio volume etanol/asam sulfat 5:1 dan rasio asam oksalat/kurkumin 15:1. Analisis menggunakan spektrofotometer dilakukan pada panjang gelombang 555 nm setelah 10 menit pembentukan kompleks boron-kurkumin. Metode pemisahan melalui distilasi memenuhi parameter-parameter validasi yaitu kurva standar linear pada rentang konsentrasi 1,2-4,8 ppm (R^2=0,9995), sensitivitas tinggi dengan koefisien ekstensi molar (ε) sebesar 5,06 x 10^5 L mol^{-1} cm^{-1}, nilai RSD 1,50%, persen perolehan kembali berada pada rentang 96,09-104,92%, limit deteksi 0,35 mg L^{-1} dan limit kuantifikasi sebesar 1,06 mg L^{-1}. Konsentrasi boron dalam sampel makanan sosis, bakso, krupuk dan tahu secara berturut-turut berada pada rentang 0,91-3,52; 1,41-3,59; 2,94-4,91dan 0,74-1,08 mg kg^{-1}. Metode distilasi ester borat ke dalam kurkumin ini cocok digunakan pada analisis boron dalam bahan pangan.

Kata kunci: boron, distilasi, ester borat, kurkumin, spektrofotometri UV-Vis

ABSTRACT

DEVELOPMENT OF BORON ANALYSIS BY UV-VIS SPECTROPHOTOMETRY VIA MODIFICATION OF ESTER BORATE DISTILLATION SYSTEM INTO CURCUMIN

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Spectrophotometric analysis of boron was developed by modification of ester borate distillation system into curcumin. Modification of distillation system aims to improve the sensitivity and selectivity of boron analysis method in complex matrices. Boron was separated by distillation as triethyl borate and reacted with curcumin. Esterification reaction was carried out in a teflon vessel using ethanol as the solvent and H_2SO_4 2.5% (w/w) as the acid catalyst for esterification. Distillation system reached optimum condition at temperature of 25 ^oC for 24 hour and 75 ^oC for 4 hour, pH 5-6, ethanol/boric acid ratio of 5:1, ethanol/sulphuric acid ratio of 5:1 and oxalic acid/curcumin ratio of 15:1. Boron-curcumin complex was measured at 555 nm after 10 minutes of reaction. Separation of boron by distillation method complied with validation parameters. The standard curve was linear in the concentration range of 1.2-4.8 ppm (R^2=0.9995), with molar extinction coefficient (ε) 5.06 x 10^5 L mol^{-1} cm^{-1} for high sensitivity level, RSD 1.50% and recovery in the range of 96.09-104.92%. Limit of detection (LOD) and limit of quantification (LOQ) were 0.35 and 1.06 mg L^{-1} respectively. Boron content in sausage, meatballs, crackers and tofu products was in the range of 0.91-3.52; 1.41-3.59; 2.94-4.91 and 0.74-1.08 mg kg^{-1}. Distillation method of ester borate into curcumin is suitable for boron analysis in food products.

Keywords: boron, distillation, ester borate, curcumin, UV-Vis spectrophotometry