

## ABSTRAK

Kopi merupakan salah satu minuman yang memiliki kafein tinggi dan paling banyak dikonsumsi oleh masyarakat Indonesia setelah minuman daun teh. Batas dosis keamanan kafein adalah 150 mg/hari atau 50 mg/sajian pada makanan dan minuman. Di Indonesia, kopi Robusta dan Arabika menjadi dua spesies utama kopi yang banyak tersedia di pasaran. Tidak jarang, bagi penikmat kopi ingin merasakan aroma kopi yang baru, yaitu dengan mencampurkan kedua jenis kopi tersebut untuk dikonsumsi.

Namun permasalahannya adalah tidak semua produk mencantumkan dengan jelas kandungan kafeinnya, sehingga batas konsumsi aman menjadi kurang jelas untuk diketahui. Maka, diperlukan metode analisis yang optimum dan dapat dipertanggungjawabkan keabsahannya dengan validasi metode untuk menetapkan kadar kafein yang terdapat dalam campuran kopi bubuk jenis Robusta dan Arabika tersebut dengan menggunakan sistem kromatografi lapis-tipis (KLT)-Densitometri. Penelitian ini adalah jenis penelitian kualitatif dan kuantitatif yang bersifat eksperimental deskriptif dengan menggunakan metode KLT-Densitometri.

Pada penelitian ini dilakukan optimasi, validasi, dan penetapan kadar senyawa kafein. Optimasi dilakukan untuk mendapatkan kondisi optimum sistem KLT-Densitometri dengan memperhatikan beberapa parameter, yaitu nilai *retardation factor* ( $R_f$ ), *resolution factor* ( $R_s$ ), *assymetry factor* ( $A_s$ ) dan *Tailing Factor* ( $T_f$ ). Hasil optimasi menunjukkan bahwa kondisi optimum menggunakan komposisi fase gerak metanol: etil: amonia 25% (3 : 40 : 7) serta jarak elusi 7,5 cm. Validasi dilakukan agar menjamin keabsahan kadar yang didapatkan pada penetapan kadar dengan memperhatikan parameter validasi, yaitu linearitas, selektivitas, akurasi, dan presisi. Hasil validasi menunjukkan bahwa hasil linearitas yang baik dengan koefisien korelasi ( $r$ ) 0,998 ; tidak memiliki nilai selektivitas dikarenakan hanya terdapat satu puncak (*peak*) dalam kromatogram sampel dan baku, nilai akurasi yang baik pada baku kafein dengan konsentrasi 250 ppm dan 450 ppm secara berturut-turut adalah 100,16 % dan 108,14 % ; serta nilai presisi yang baik pada ketiga baku kafein dengan konsentrasi 250 ppm, 450 ppm, dan 650 ppm secara berturut-turut adalah 6,69 % ; 5,46 % ; dan 4,55%. Hasil penetapan kadar menunjukkan bahwa dalam 1 kemasan sampel mengandung kafein sebesar  $110,42 \pm 3,60$  mg dengan KV 3,26%. Hasil kadar tersebut tidak memenuhi syarat keberterimaan batas aman konsumsi harian kafein yaitu 50 mg/sajian.

**Kata kunci:** Kopi, kafein, penetapan kadar, kromatografi lapis tipis, densitometri

## ABSTRACT

Coffee is a drink that has high caffeine and is most consumed by Indonesian people after tea leaves. The safe dose limit for caffeine is 150 mg/day or 50 mg/serving in food and drinks. In Indonesia, Robusta and Arabica coffee are the two main coffee species that are widely available on the market. It is not uncommon for coffee lovers to want to experience a new coffee aroma, namely by mixing the two types of coffee for consumption.

However, the problem is that not all products clearly state their caffeine content, so the safe consumption limits are less clear to know. So an optimal analysis method is needed and its validity can be accounted for using a validation method to determine the caffeine content contained in the mixture of Robusta and Arabica ground coffee using a thin-layer chromatography (TLC)-Densitometry system. This research is a type of qualitative-quantitative research with a descriptive experimental nature using the KLT-Densitometry method. The stationary phase is silica gel 60 F<sub>254</sub> and the mobile phase composition is methanol: ethyl acetate: 25% ammonia (6.5 : 38.5 : 5) and (3 : 40 : 7) and the elution distance are 5 cm and 7.5 cm. This research aims to determine the caffeine content contained in a mixture of Robusta and Arabica coffee powder by paying attention to several optimization, validation and concentration parameters.

In this research, optimization, validation and determination of caffeine compound levels were carried out. Optimization was carried out to obtain optimum conditions for the TLC-Densitometry system by taking into account several parameters, namely the retardation factor (R<sub>f</sub>), resolution factor (R<sub>s</sub>), asymmetry factor (A<sub>s</sub>) and Tailing Factor (T<sub>f</sub>). This optimization was carried out with a stationary phase in the form of silica gel 60 F<sub>254</sub> and the selection of the mobile phase composition methanol: ethyl acetate: ammonia 25% (6.5: 38.5: 5) and (3: 40: 7) and an elution distance of 5 cm and 7.5 cm. Optimization results show that the optimum conditions are in the mobile phase composition of methanol: ethyl: ammonia 25% (3 : 40 : 7) and an elution distance of 7.5 cm. Validation is carried out to ensure the validity of the levels obtained in the determination of levels by paying attention to validation parameters, namely linearity, selectivity, accuracy and precision. The validation results show that the linearity results are good with a correlation coefficient (r) of 0.998; does not have a selectivity value because there is only one peak in the chromatogram of the sample and standard, good accuracy values for caffeine standards with concentrations of 250 ppm and 450 ppm respectively are 100.16% and 108.14%; and good precision values for the third caffeine standard with concentrations of 250 ppm, 450 ppm and 650 ppm respectively are 6.69%; 5.46 % ; and 4.55%. The results of the assay showed that 1 sample package contained 110.42 ± 3.60 mg of caffeine with a CV of 3.26%. The results of these levels do not meet the acceptance requirements for the safe daily consumption limit for caffeine, namely 50 mg/serving.

Key words: Coffee, caffeine, assay, thin layer chromatography, densitometry.