

ISOLASI DAN PENENTUAN KADAR KAFEIN DALAM SERBUK KOPI DARI BERBAGAI DAERAH DI BALI

Oleh

Gede Eka Amerta Saputra, NIM 2253013003

Jurusan Kimia Program Studi D4 Kimia Terapan

ABSTRAK

Biji kopi mengandung beragam metabolit sekunder, antara lain kafein, asam klorogenat, senyawa volatil, mineral, dan asam-asam organik. Di antara senyawa tersebut, kafein merupakan komponen utama yang berperan penting, baik dalam membentuk cita rasa kopi maupun dalam memberikan efek fisiologis bagi tubuh. Kafein diketahui memiliki banyak manfaat di bidang kesehatan, seperti membantu meredakan stres, meningkatkan performa fisik, serta mencegah penurunan fungsi kognitif apabila dikonsumsi dalam jumlah yang tidak berlebihan. Penentuan kadar kafein dalam kopi dapat dilakukan menggunakan spektrofotometri UV-Vis, spektroskopi inframerah, kromatografi gas spektrometri massa (GCMS), dan kromatografi cair kinerja tinggi (HPLC). Meskipun demikian, kajian mengenai kadar kafein dalam kopi Bali masih terbatas dan sebagian besar penelitian yang ada hanya difokuskan pada kopi dari daerah kintamani. Penelitian ini bertujuan untuk mengisolasi dan menentukan kadar kafein dalam serbuk kopi yang berasal dari tiga wilayah berbeda di Bali, yaitu Pupuan, Gesing, dan Banyuatis. Proses isolasi kafein dilakukan melalui metode ekstraksi cair-cair menggunakan corong pisah dengan pelarut organik, kemudian dilanjutkan dengan rekristalisasi untuk meningkatkan kemurnian senyawa yang diperoleh. Analisis kadar kafein dilakukan dengan metode HPLC menggunakan kolom silika fase balik dengan kondisi operasi sebagai berikut: laju alir 1 mL/menit, detektor UV pada panjang gelombang 278 nm, volume injeksi 20 μ L, serta fase gerak isokratik campuran metanol:air (95:5). Hasil analisis menunjukkan bahwa puncak senyawa kafein dalam kromatogram HPLC muncul pada menit 3,3 – 3,4 menit. Hasil uji kadar kafein menunjukkan bahwa sampel dari Pupuan memiliki kadar kafein terendah yaitu 496,7161 μ g/mL, Gesing sebesar 508,0268 μ g/mL, dan Banyuatis dengan kadar tertinggi sebesar 575,7748 μ g/mL. Perbedaan kadar kafein kemungkinan dipengaruhi oleh faktor internal seperti varietas kopi serta faktor eksternal seperti praktik agronomi dan kondisi lingkungan tumbuh.

Kata Kunci: Kopi, Kafein, *High Performance Liquid Chromatography* (HPLC), Metabolit sekunder

Isolation and Determination of Caffeine Content in Ground Coffee from Various Regions in Bali

By

Gede Eka Amerta Saputra, NIM 2253013003

Departement of Chemistry, Study Program Chemical Applied

ABSTRACT

Coffe beans contain a variety of secondary metabolites, including caffeine, chlorogenic acids, volatile compounds, minerals, and organic acids. Among these compounds, caffeine is the major component, playing a significant role in both the flavor profile of coffe and it's physiological effects on the human body. Caffeine is known to provide several health benefits, such as reducing stress, enhancing physical performance, and preventing cognitive decline when consumed in moderate amounts. The determination of caffeine content in coffee can be carried out using various analytical techniques, including UV-Vis spectrophotometry, infrared spectroscopy, gas chromatography-mass spectrometry (GC-MS), and high-performance liquid chromatography (HPLC). Despite the growing popularity of Balinese coffee, research on it's caffeine content remains limited. Most existing studies have focused primarily on coffee from the Kintamani region. Therefore, this study aims to isolate and quantify the caffeine content in coffee powders from three different regions in Bali: Pupuan, Gesing, and Banyuatis. The isolation of caffeine was carries out using a liquid-liquid extraction method with a separatory funnel and organic solvent, followed by recrystallization to enhance the purity of the isolated compound. Quantitative analysis of caffeine was conducted using HPLC equipped with a reversed-phase silica column under the following operating conditions: a flow rate of 1.0 mL/min, UV detection at 278 nm, injection volume of 20 μ L, and an isocratic mobile phase composed of methanol and water (95:5, v/v). The chromatographic analysis showed that the caffeine peak appeared at a retention time of 3,3 – 3,4 minutes. The quantitative results indicated that the coffe sample from Pupuan had the lowest caffeine content, measured at 496.7161 μ g/mL, followes by Gesing 508,0268 μ g/mL, and Banyuatis with the highest content at 575.7748 μ g/mL. The variation in caffeine levels may be attributed to internal factors such as coffe varietals, as well as external factors including agronomic practices and environmental growing conditions.

Keywords: Coffee, Caffeine, Bali, High Performance Liquid Chromatography (HPLC), Secondary metabolites