

ABSTRAK

DETEKSI *NON-TARGETED* BEBERAPA KOPI SPESIALTI ROBUSTA ASAL TANGGAMUS SECARA *INTACT* MENGGUNAKAN *PORTABLE LED-BASED FLUORESCENCE SPECTROSCOPY*

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Kopi robusta (*Coffea canephora*) adalah satu dari banyaknya varietas kopi yang paling banyak dibudidayakan di Indonesia. Kabupaten Tanggamus merupakan salah satu daerah di Indonesia yang menghasilkan produk kopi robusta. Beberapa kopi robusta asal Tanggamus diproduksi dengan cara khusus. Proses khusus tersebut membutuhkan waktu cukup lama dan kopi yang dihasilkan sedikit sehingga membuat kopi spesialti robusta asal Tanggamus menjadi langka dan mahal. Hal tersebut dapat menimbulkan pemalsuan label kopi (*mislabeled*). Tujuan dari penelitian ini adalah untuk mengetahui perbedaan empat jenis kopi robusta asal Tanggamus yaitu kopi robusta Codot *peaberry* (CP), kopi robusta Codot biasa (CB), kopi robusta natural proses (NP) dan kopi robusta natural fermentasi (NF) dengan mengambil spektra pada sampel *green bean* kopi menggunakan alat *LED-based fluorescence spectroscopy* portabel. Jumlah sampel tiap jenis kopi sebanyak 100 sampel dan untuk satu sampel diambil spektra sebanyak dua kali pada total keseluruhan data sebanyak 800 data. Metode yang digunakan dalam penelitian ini adalah *principal component analysis* (PCA) dan *soft independent modelling of class analogy* (SIMCA). PCA data original untuk PC1 memberikan informasi varian sebanyak 64% dan PC2 sebanyak 25%, maka didapat kumulatif dua PC pertama (PC1+PC2) sebesar 89% yang sudah mampu menjelaskan varian data. Hasil PCA dari *pretreatment SNV+ smoothing moving average 9 segment* memiliki nilai persentase PC1 sebesar 82% dan PC2 sebanyak 9% dengan nilai kumulatif dua PC pertama (PC1+PC2) yaitu sebesar 91%. Klasifikasi model SIMCA CB dan NF data *original* memiliki nilai akurasi sebesar 60%, sensitivitas 72,2%, spesifisitas 56,5% dan *error* 40%, sedangkan klasifikasi menggunakan data *pretreatment SNV+ smoothing moving average 9 segment* memiliki akurasi sebesar 97,4%, sensitivitas sebesar 100%, spesifisitas sebesar 95% dan nilai *error* sebesar 2,6%. Berdasarkan kurva ROC yang menjelaskan hubungan spesifisitas dan sensitivitas, klasifikasi CB dan NF tergolong sangat baik untuk level signifikansi 10% dan 25% karena tepat berada di garis koordinat (0,1), sedangkan untuk level signifikansi 5% tergolong sebagai baik karena semakin mendekati garis koordinat (0,1).

Kata kunci : Kopi robusta, kopi Codot, kopi natural fermentasi, kopi natural proses, *LED-based fluorescence spectroscopy*, PCA, SIMCA

ABSTRACT

NON-TARGETED INTACT DETECTION OF SEVERAL SPECIALTY ROBUSTA GREEN COFFEE BEANS FROM TANGGAMUS USING PORTABLE LED-BASED FLUORESCENCE SPECTROSCOPY

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Robusta coffee (*Coffea canephora*) is one of the most widely cultivated coffee varieties in Indonesia. Tanggamus Regency is one of the regions in Indonesia that produces robusta coffee. Some robusta coffees from Tanggamus are produced using special methods. These special processes take a considerable amount of time and result in a limited amount of coffee, making Tanggamus specialty robusta coffee rare and expensive. This situation can lead to coffee label fraud (mislabeling). This study aims of this study is to identify the differences between four types of robusta coffee from Tanggamus : Codot *peaberry* robusta (CP), regular Codot robusta (CB), natural process robusta (NP), and natural fermentation robusta (NF) by analyzing the spectra of green bean samples using a portable LED-based fluorescence spectroscopy device. The number of samples for each coffee type was 100, and spectra were taken twice for each sample, totaling 800 data points. The methods used in this study were principal component analysis (PCA) and soft independent modeling of class analogy (SIMCA). The original PCA data for PC1 provided 64% variance information, and PC2 provided 25%, resulting in a cumulative variance of 89% for the first two PCs (PC1+PC2), which was sufficient to explain the data variance. The PCA results from the pretreatment SNV+ smoothing moving average of 9 segments showed that PC1 accounted for 82% and PC2 for 9%, with a cumulative variance of 91% for the first two PCs (PC1+PC2). The SIMCA model classification for CB and NF with original data had an accuracy of 60%, sensitivity of 72,2%, specificity of 56,5%, and an error rate of 40%. In contrast, the classification using pretreatment SNV+ smoothing moving average of 9 segments had an accuracy of 97,4%, sensitivity of 100%, specificity of 95%, and an error rate of 2,6%. Based on the ROC curve, which explains the relationship between specificity and sensitivity, the CB and NF classification is considered very good for significance levels of 10% and 25% as it lies precisely on the coordinate line (0,1). At a significance level of 5%, the classification is considered good as it approaches the coordinate line (0,1).

Keywords: Robusta coffee, Codot coffee, fermented natural coffee, processed natural coffee, LED-based fluorescence spectroscopy, PCA, SIMCA