

IMPLEMENTASI *PRINCIPAL COMPONENT ANALYSIS* (PCA) TERHADAP HASIL DETEKSI KUALITAS *COCOA BUTTER* MENGUNAKAN *ELECTRONIC NOSE* (E-NOSE)

INTISARI

Free fatty acid (FFA) atau asam lemak bebas merupakan salah satu parameter kualitas lemak kakao (*cocoa butter*). Sesuai dengan SNI 3748:2009 nilai FFA maksimum untuk *cocoa butter* sebesar 1,75%. Standar ini menjadi acuan dalam menentukan kualitas *cocoa butter*. Penurunan kualitas *cocoa butter* salah satunya ditandai dengan keberagaman *volatile organic compound* (VOC) yang mengakibatkan ketengikan akibat dari kerusakan *cocoa butter* berupa reaksi oksidasi yang melibatkan asam lemak. Hal ini menunjukkan bahwa pengujian kualitas *cocoa butter* dapat dilakukan dengan menggunakan aroma/gas *cocoa butter*. *Electronic nose* (*e-nose*) merupakan salah satu instrumen yang dapat digunakan untuk analisis berdasarkan aroma/gas suatu material. Penelitian ini dilakukan untuk mendeteksi kualitas *cocoa butter* berdasarkan pola respon sensor *e-nose* dengan model pengenalan pola *principal component analysis* (PCA). Pada penelitian ini, *e-nose* yang terdiri dari 10 buah sensor gas tipe *metal oxide semiconductor* (MOS), 1 sensor suhu dan 1 sensor kelembaban digunakan untuk mendeteksi perbedaan kualitas *cocoa butter* berdasarkan pola respon sensor *e-nose* yang terkonfirmasi dengan parameter kualitas FFA yaitu *cocoa butter* mutu *accepted*/diterima (nilai FFA < 1,75%) dan *cocoa butter* mutu *rejected*/ditolak (nilai FFA > 1,75%). Respon sensor *e-nose* dilakukan pra-pemrosesan sinyal dan ekstraksi ciri dari masing-masing sensor. Data yang telah diekstrak dianalisis dengan model pengenalan pola kemiripan atau perbedaan respon sensor *e-nose* metode *principal component analysis* (PCA). Hasil yang diperoleh menunjukkan *e-nose* dapat mendeteksi perbedaan kualitas *cocoa butter* pada kelompok data sampel yang berbeda dengan kumulatif proporsi varians sebesar 86,27% untuk PCA yang menggunakan parameter ekstraksi ciri terbaik yaitu nilai rata-rata.

Kata kunci: *cocoa butter*, *free fatty acid* (FFA), *electronic nose* (*e-nose*).

PRINCIPAL COMPONENT ANALYSIS (PCA) IMPLEMENTATION ON COCOA BUTTER QUALITY DETECTION RESULTS USING ELECTRONIC NOSE (E-NOSE)

ABSTRACT

Free fatty acid (FFA) is one of the parameters for the quality of cocoa butter. Based on SNI 3748:2009, the maximum FFA value for cocoa butter is 1.75%. This standard is a reference in determining the quality of cocoa butter. The decline in the quality of cocoa butter is marked by the diversity of volatile organic compounds (VOC), which causes rancidity as a result of damage to cocoa butter in the form of oxidation reactions involving fatty acids. Quality of cocoa butter can be test by the aroma/gas of cocoa butter. Electronic nose (e-nose) is an instrument that can be used for analysis based on the aroma/gas of a material. This study conducted to detect the quality of cocoa butter based on the response pattern of e-nose sensor using the principal component analysis (PCA) pattern recognition model. In this study, e-nose consisting of 10 metal oxide semiconductor (MOS) type gas sensors, 1 temperature sensor and 1 humidity sensor was used to detect differences quality of cocoa butter based on the response pattern of the e-nose sensor which was confirmed with the FFA quality parameter, accepted quality cocoa butter (FFA value<1.75%) and rejected quality cocoa butter (FFA value>1.75%). The response of the e-nose sensor is processed by signal pre-processing and feature extraction from each sensor. The extracted data were analyzed using the principal component analysis (PCA) method to identify patterns of similarity or difference in e-nose sensor responses. The results obtained show that e-nose can detect differences in the quality of cocoa butter in different sample data groups with a cumulative proportion of variance 86.27% for PCA using the best feature extraction parameter, namely the average value.

Keyword: cocoa butter, free fatty acid (FFA), electronic nose (e-nose).