

DETEKSI KEBERADAAN VOLATILE ORGANIC COMPOUND PADA PROSES FERMENTASI NATA DE COCO MENGGUNAKAN HIDUNG ELEKTRONIK

INTISARI

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Nata de coco merupakan produk pangan yang dihasilkan dari fermentasi air kelapa dengan bakteri *Acetobacter xylinum*. Selama proses fermentasi berlangsung, mikroorganisme akan melepaskan *volatile organic compound* (VOC) yang mengakibatkan terbentuknya aroma khas pada fermentasi yang bersifat mudah menguap. VOC dapat dideteksi dari gas yang dihasilkan selama proses fermentasi *nata de coco*. Pola profil gas fermentasi *nata de coco* yang terdiri dari berbagai jenis VOC merupakan kriteria utama untuk menilai kualitas BC dan dapat mendeteksi keberhasilan proses fermentasi. Oleh karena itu, perubahan pola profil gas selama keseluruhan proses fermentasi harus diselidiki untuk evaluasi.

Hidung elektronik dapat mendeteksi pola profil gas berdasarkan perubahan tegangan karena adanya keberagaman VOC selama proses fermentasi *nata de coco* berlangsung. Pada penelitian ini, hidung elektronik yang digunakan terdiri dari 10 buah sensor gas tipe *metal oxide semiconductor* (MOS), 1 sensor suhu, dan 1 sensor kelembaban digunakan untuk mendeteksi karakteristik VOC pada proses fermentasi *nata de coco* berdasarkan pola respon sensor hidung elektronik. Respon sensor hidung elektronik 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 hidung elektronik metode PCA.

Hasil yang diperoleh menunjukkan hidung elektronik mampu membedakan kualitas fermentasi *nata de coco* berdasarkan waktu fermentasi dan perbedaan aroma sampel dengan analisis PCA menggunakan parameter ekstraksi ciri mean, median, maksimum, standar deviasi, dan gradien sebesar 86,734%; 86,314%; 85,378%; 82,040%; dan 81,498%. Pada fermentasi *nata de coco* terjadi peningkatan tren VOC berdasarkan waktu fermentasi di jam ke-0 hingga jam ke-64 dan jam ke-72 hingga jam ke-160. Sedangkan, pada jam ke-64 dan jam ke-72 terjadi peningkatan secara signifikan. Berdasarkan pengujian GC-MS yang telah dilakukan, dapat dikonfirmasi bahwa ada tiga komponen volatil yang memiliki kesamaan dengan target gas pada S8, berupa 2-propanon (aseton) sebesar 38,70%, etil alkohol (etanol) sebesar 35,04%, dan pirazin berupa 3-Aminopyrrolidine (*n-heksana*) sebesar 14,80%.

Kata kunci: fermentasi, hidung elektronik, *nata de coco*, *principal component analysis* (PCA), *volatile organic compounds* (VOC)

DETECTION VOLATILE ORGANIC COMPOUNDS EXISTENCE IN THE NATA DE COCO FERMENTATION PROCESS USING ELECTRONIC NOSE

ABSTRACT

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Nata de coco is a food product produced from fermenting coconut water with *Acetobacter xylinum* bacteria. During the fermentation process, microorganisms will release volatile organic compounds (VOC) which result in the formation of a characteristic aroma in the fermentation which is volatile. VOCs can be detected from the gas produced during the nata de coco fermentation process. The gas profile pattern of nata de coco fermentation which consists of various types of VOC is the main criterion for assessing the quality of BC and can detect the success of the fermentation process. Therefore, changes in gas profile patterns during the entire fermentation process should be investigated for evaluation.

The electronic nose can detect gas profile patterns based on changes in voltage due to the diversity of VOCs during the nata de coco fermentation process. In this study, the electronic nose used consisted of 10 metal oxide semiconductor (MOS) type gas sensors, 1 temperature sensor, and 1 humidity sensor used to detect VOC characteristics in the nata de coco fermentation process based on the response pattern of the electronic nose sensor. The electronic nose sensor response is carried out by signal pre-processing and feature extraction from each sensor. The extracted data was analyzed using a pattern recognition model for similarities or differences in electronic nose sensor responses using the PCA method.

The results obtained show that the electronic nose is able to differentiate the quality of nata de coco fermentation based on fermentation time and differences in sample aroma with PCA analysis using feature extraction parameters of mean, median, maximum, standard deviation and gradient of 86.734%; 86.314%; 85.378%; 82.040%; and 81.498%. In nata de coco fermentation, there was an increasing VOC trend based on fermentation time from 0 to 64 hours and 72 hours to 160 hours. Meanwhile, at the 64th hour and 72nd hour there was a significant increase. Based on the GC-MS testing that has been carried out, it can be confirmed that there are three volatile components that are similar to the target gas in S8, in the form of 2-propanone (acetone) at 38.70%, ethyl alcohol (ethanol) at 35.04%, and pyrazine in the form of 3-Aminopyrrolidine (n-hexane) of 14.80%.

Keywords: *fermentation, electronic nose, nata de coco, principal component analysis (PCA), volatile organic compounds (VOC).*