

Sesame Oil Quality Evaluation Using Sensing Technology and Chemical Identification

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Outline

1. 前言
2. 芝麻油化學組成
 - 2.1 脂肪酸組成
 - 2.2 氣味化合物
 - 2.3 外觀顏色與差異
3. 氣體感測器篩選與檢測
4. 結論

Abstract

芝麻油為高價調味油品，可能成為經濟摻偽之標的。因此，本研究目的為鑑定芝麻油脂肪酸與氣味化合物組成，並比較芝麻油摻偽與儲藏後之差異，藉由感測器以非破壞性檢測方法，與脂肪酸和氣味化合物比對，建立快速篩檢方法，評估芝麻油摻偽與品質。芝麻油以氣相層析火焰離子偵測器 (Gas chromatograph-flame ionization detector, GC-FID) 鑑定脂肪酸，主要以亞麻油酸 (41.60~45.78%) 與油酸 (36.17~41.54%) 組成，其次為棕櫚酸 (9.13~10.07%) 與硬脂酸 (4.38~6.84%)。芝麻油氣味化合物以頂空固相微萃取 (Headspace solid-phase microextraction, HS-SPME)，經氣相層析質譜儀 (Gas chromatography-mass spectrometry, GC-MS) 鑑定，以 Pyrazines 種類與含量最多，經氣味化合物稀釋分析 (Aroma extract dilution analysis, AEDA) 共鑑定出 7 種關鍵氣味化合物，包括 2-Methoxyphenol (酚味、藥味)、3-Ethyl-2,5-dimethylpyrazine (咖啡)、1H-Pyrrole 2-carboxaldehyde (甜味)、2-Furanmethanol (堅果、甜味)、Acetylpyrazine (堅果、烘烤) 以及 2 個未知化合物 Unknown 6 (堅果、烘烤)、Unknown 7 (堅果、咖啡)。芝麻油經摻混大豆油 $\geq 5\%$ 、玉米油 $\geq 15\%$ 可發現非純芝麻油，外觀顏色隨著摻混量增加， L^* 增加， a^* 和 b^* 降低，色差增大。芝麻油經儲藏後，反式 C18:1 含量增加，脂質氧化產物包括 Hexanal、2-Pentylfuran 和 Hexanoic acid 增加，Pyrazines 減少，顏色改變。氣體感測器 MQ-3、MQ-6、MQ-9、MQ-136、MQ138 及 TGS-2600、TGS-2602 和 TGS-2620 與芝麻油氣味濃度具高度依存性 ($R > 0.89$)，Methylpyrazine 150 ppm 以下有線性關係 ($R^2 > 0.92$)。未來可依反式 C18:1、脂質氧化產物、Pyrazines、呈色及篩選之氣體感測器訊號特徵，作為芝麻油品質及摻混之判斷指標。

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