

基于电子鼻和 HS-SPME-GC-MS 分析蒸汽爆破对杜仲嫩叶和成熟叶茶香气特征的影响

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摘要: 为探究蒸汽爆破(汽爆)辅助加工制成杜仲叶茶的挥发性成分差异和主要呈香特征, 本研究以杜仲‘华仲 8 号’嫩叶和成熟叶为对象, 采用汽爆技术对杜仲叶进行处理, 基于电子鼻和顶空固相微萃取-气相色谱-质谱联用法(Headspace Solid-Phase Microextraction Gas Chromatography-Mass Spectrometry, HS-SPME-GC-MS), 解析汽爆对两种杜仲茶香气特征的影响。主成分分析和线性判别分析对电子鼻数据模型拟合度高, 杜仲嫩叶和成熟叶茶汽爆前后香气特征均存在显著差异。HS-SPME-GC-MS 检测共鉴定出 178 种挥发性成分, 通过正交偏最小二乘法判别分析(变量重要性投影值 >1)以及 Kruskal-Wallis H 检验($P<0.05$)进一步筛选出 24 种香气物质, 发现汽爆前嫩叶茶关键香气物质为二氢猕猴桃内酯。汽爆后嫩叶茶关键呈香物质在此基础上增加了壬醛、苯甲醛和苯乙醛, 呈现柑橘香、花香、焦糖香、苦杏仁味、坚果香、玫瑰香和巧克力香。汽爆前熟叶茶无关键香气物质, 汽爆后熟叶茶关键香气物质为二氢猕猴桃内酯和壬醛, 呈现甜桃香、木香味、柑橘香、花香和焦糖香。研究结果可为开发杜仲叶茶饮品提供参考依据。

关键词: 杜仲‘华仲 8 号’; 香气成分; 蒸汽爆破; 杜仲茶

Effect of Steam Explosion on the Aroma Characteristics of *Eucommia ulmoides* Tender and Mature Leaf Tea based on Electronic Nose and HS-SPME-GC-MS

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Abstract: In order to compare the differences of volatile components and main aroma characteristics between *Eucommia ulmoides* tender leaf tea and mature leaf tea pre-treated by steam explosion (SE), e-nose and HS-SPME-GC-MS were applied to detected the volatile components of *E. ulmoides* 'Huazhong 8' leaf with and without SE treatment. The results showed that the principal component analysis and linear discriminant analysis models fitted well for e-nose data, which suggested that the aroma characteristics were significantly different between the tender leaf with and without SE, and so did the mature leaf. There were 178 volatile components identified by HS-SPME-GC-MS, among which 24 kinds of volatile components were further screened by orthogonal partial least squares

discriminant analysis (VIP value > 1) and Kruskal-Wallis H test (P value < 0.05). The key aroma substance of tender leaf tea without SE was dihydrokiwi lactone. The newly emerged aroma substances of tender leaf tea with SE were nonanal, benzaldehyde and phenylacetaldehyde, presenting aroma of citrus, flower, caramel, bitter almond flavor, nutty, rose and chocolate. There was no key aroma substance of mature leaf tea without SE, while there emerged dihydrokiwi lactone and nonanal in mature leaf tea pre-treated by SE, presenting fragrances of sweet peach, wood, citrus, flower and caramel. The results of the study can provide a reference for *E. ulmoides* leaves for tea beverage development.

Keywords: *Eucommia ulmoides* 'Huazhong 8'; aroma composition; steam explosion; *Eucommia ulmoides* tea
中图分类号: TS272; TS201 文献标志码: A 文章编号: