Determination of Chemical Components of Benzene/Ethanol Extractives of Eucalyptus urograndis Wood by GC/MS

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Abstract: The chemical components of benzene/ethanol extractives of fresh Eucalyptus urograndis wood chips were separated and identified by GC/MS after enriching. Relative content of each chemical component was determined by area normalization. Thirty compounds representing 87.88% of the extractives which take on 42 peaks were identified. The most abundant and valuable constituents were 1, 2-benzenedicarboxylic acid, diisooctyl ester (17.53%), 1, 2-benzenedicarboxylic acid, bis(2-methylpropyl) ester (8.48%), dibutyl phthalate (8.12%), butanedioic acid, methyl, bis(1-methylpropyl) ester (7.02%), hexanedioic acid, bis(2-methylpropyl) ester (6.89%), 2, 6, 10, 15, 19, 23-hexamethyl-2, 6, 10, 14, 18, 22-tetracosahexaene (4.53%), hexadecanoic acid, ethyl ester (3.77%), 2-isopropyl-1-methylnaphthalene (2.97%), hexacosane (2.63%), di(2-ethylhexyl) adipate (1.98%), octacosane (1.93%), salsoline (1.90%) and so on.

Key words: gas chromatography; mass spectrometry; extractives; Eucalyptus urograndis
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Wood extractives not only consumes more bleaching agents and adhesive, have more serious affects on the quality of adhesion for wood-based panels and paper, but also increase more difficulties on the treatments of both wastewater and black-liquid for wood industry paper mill[1-2]. Therefore many enterprises have to raise pretreated procedure of wood chips to decrease the disadvantageous effects from wood extractives. But wastewater from chip pretreatment becomes a difficult and urgent issue. E. urograndis has been widely planted in South China and just mainly used as wood chips which are the power added-value products now. So the test is important and necessary.

1 Materials and methods

1.1 Materials

A 5.5-year-old E. urograndis was collected from Yangjiang Forest Farm. Benzene and ethanol were chromatographic grade.

1.2 GC/MS analysis

GC/MS analysis was carried out on a TRACE GC-2000 GC-MS^{TM} (FINNIGAN MAT Corp., America). A capillary column DB-1 (30 m × 0.25 mm), coated with a non-polar phase (hewlett-packard-5 cross-linked 5% phenyl methyl silicone) was used. The GC column temperature was programmed as follows: 10 ℃/min from 100 to 200 ℃, 5 ℃/min from 200 to 250 ℃. The mass range was from m/z 35 to 335, with an ionizing voltage of 70 eV and an ionization current of 150 μA. The flow velocity of He was 1 mL/min.

1.3 Methods

The 40 ~ 60 mesh powder was obtained from the fresh wood, and extracted in benzene/ethanol solution according to 70 ~ 75 ℃, 5 ~ 6 h and $V_{solution}/V_{wood}$ 100 double for enough extractives solution. It was dried by anhydrous bitter salt, then exposed to N_2 flow under air temperature, concentrated to 20 mL, finally 0.2 μL solution was drawn out so as to be used as GC/MS analysis.

2 Results

The total ion chromatogram of the benzene/ethanol extractives by GC/MS is shown in Fig. 1. Relative content of each component was counted by area normalization. Analyzing the MS data, the NIST standard MS map by computer and papers[2-3], 30 compounds which occupy 87.88% of the total 42 peaks areas were identified, whose principal and valuable constituents

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were as follow: 1, 2-benzenedicarboxylic acid, diisooctyl ester (17.53%), 1, 2-benzenedicarboxylic acid, bis(2-methylpropyl) ester (8.48%), dibutyl phthalate (8.12%), butanedioic acid, methyl, bis(1-methylpropyl) ester (7.02%), hexanedioic acid, bis(2-methylpropyl) ester (6.89%), 2, 6, 10, 15, 19, 23-hexamethyl-2, 6, 10, 14, 18, 22-tetracosahexaene (4.53%), hexadecanoic acid, ethyl ester (3.77%), 2-isopropyl-1-methylnaphthalene (2.97%), hexacosane (2.63%), di(2-ethylhexyl) adipate (1.98%), 3, 4-dimethoxybenzene-1, 2-diol (1.95%), octacosane (1.93%), saxoline (1.90%), phenol, 2-methoxy-4-(1-propenyl)-(1.89%), ethyl linolenate (1.82%), butanedioic acid, bis(2-methylpropyl) ester (1.22%), 9-octadecenoic acid (Z)-, ethyl ester (0.98%), 9-octadecenamide, (Z)- (0.85%), pentatriacontane (0.67%), gynolutone (0.58%), hexadecanoic acid, methyl ester (0.57%), nonadecane (0.50%), heneicosane (0.46%), hexadecane, 2, 6, 10, 14-tetramethyl- (0.38%), etc.

3　Conclusion

Octadecenamide has the effect on mitigation and hypnogenesis, and can assist the reaction of 5-HT_2 to 5-HT. Heneicosane, Nonadecane which is the main component of QingHaiHongJingTian naphtha can cure chough, emphysis, hemoptysis, leucorrhea, turgidity, burn, etc, and linolic acid which can be got by hydrolyzing octadecenoic acid ester, can decrease the cholesterin in blood, and has the effect on giving pabulum to brain cell and adjust nerve[4]. Benzenedicarboxylic acid ester is a very good flavor. What's more, 2, 6, 10, 15, 19, 23-hexamethyl-2, 6, 10, 14, 18, 22-tetracosahexaene is very expensive, and can reinforce immunity ability, adjust blood and defend cancer. In brief, the benzene/ethanol extractives of E. urograndis wood is cheap natural materials of medicine, spice, skin protestants and fine chemical product.

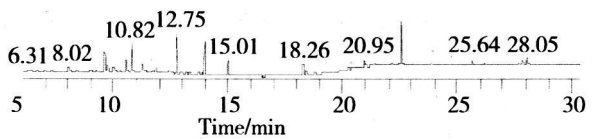

Fig. 1　Total ion chromatogram of E. urograndis Wood Benzene/Ethanol Extractives by GC/MS

References:

[1] JOSEPH, FRANK W C, GILLES L, et al. Degradation and detoxilcation of softwood extractives by saps fungi [J]. Bioresource Tech, 2000, 71: 13-20.

[2] HILLIS W E. Wood extractives and their significance to the pulp and paper industy [M]. New York: Academic Press, 1962: 513—520.

[3] PENG W, LI K, FAN Z. Determination of chemical components of cold water extractives of E. urograndis by GC/MS [J]. T of China Pulp and Paper, 2006, 21 (4): 11-13.

[4] GONZÁLEZ J, CRUZ J M, DOMINGUEZ H, et al. Production of antioxidants from Eucalyptus globulus wood by solvent extraction of hemicellulose hydrolysates [J]. Food Chemistry, 2004, 84: 243—251.

尾巨桉木材苯 /醇提取物成分的气相色谱 /质谱分析

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摘　要：采用混合溶剂萃取法从新鲜尾巨桉木材中提取低分子量成分，并用气相色谱 /质谱法联机分析技术，用色谱峰面积归一化法计算各组分的相对含量。共分离出 42个峰，并从中鉴定出 30个化合物，占总峰面积的 87.88%。主要成分为 1, 2—邻苯二甲酸二异辛酯 (17.53%)、1, 2—邻苯二甲酸双 (2—甲丙基) 酯 (cas) (8.48%)、二丁基酞酸盐 (8.12%)、丁二酸一甲基—双 (1—甲丙基) 酯 (7.02%)、乙二酸双 (2—甲丙基) 酯 (cas) (6.89%)、2, 6, 10, 15, 19, 23六甲基 鲨烯 (4.53%)、十六酸乙酯 (cas) (3.77%)、2—异丙基—1—甲烷基萘 (2.97%)、二十六烷 (2.63%)、己二酸双 (2—乙己基) 酯 (1.98%)、二十八烷 (1.93%)、鹿尾草碱 (1.90%) 等。

关键词：气相色谱；质谱；提取物；尾巨桉

中图分类号：TS71