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Molecules and functions of rosewood: *Pterocarpus cambodianus*

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Abstract Pterocarpus is a high-end, expensive furniture materials collectively. Pterocarpus products have a certain human health function. In this paper, *Pterocarpus cambodianus* Pierre as an example, we study its human health components by using PY–GC–MS, TDS–GC–MS and GC–MS. The composition of known human health functions was studied by reviewing the literature. 1-Heptatriacotanol has anti-hypercholesterolemic effects. Cryptomeridiol is a natural product of anti-Alzheimer's disease and antispasmodic nature, and has a significant medicinal value. 7-Methyl-Z-tetradecen-1-ol acetate has the effect of heat and heat cough. .alpha.-Bisabolol can be used to treat leishmaniasis caused by Lactobacillus infants.

1. Introduction

Pterocarpus cambodianus Pierre mainly grown in Vietnam, Laos, Malaysia, Thailand, belonging to Leguminosae, Pterocarpus L. Dalbergia cochinchinensis Pierre wood for the bulk material, tube hole can be seen with the eye, heartwood was reddish brown or purple red brown, with a strong woody flavor, rich in oil. Wood with high strength, big hardness, the surface with the depth of the stripes or landscape-like pattern, air dry density of 0.94–1.01 g/cm^3. Its wood water leaching solution has obvious blue fluorescence phenomenon. *Pterocarpus cambodianus* Pierre commonly used to produce high-grade furniture, ornamental works of art and musical instruments. Traditionally, the *Pterocarpus cambodianus* Pierre is considered to be useful for human health functions. In this paper, the *Pterocarpus cambodianus* Pierre powder was analyzed by PY–GC–MS, TDS–GC–MS, TG and FT-IR; The extracts of ethanol, ethanol/benzene and ethanol/methanol in the *Pterocarpus cambodianus* Pierre were analyzed by GC–MS and FT-IR; To determine the active molecules of *Pterocarpus cambodianus* Pierre, figurative effect of human care function.

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2. Material and methods

2.1. Materials

The *Pterocarpus cambodianus* Pierre used in the experiment was produced in Vietnam. When we do the experiment, the *Pterocarpus cambodianus* Pierre are first pulverized and then tested with the obtained wood powder. The ethanol, benzene and methanol used in the experiments were purely chromatographed. Quantitative filter paper should be extracted with ethanol for 12 h. The three extracts used in the experiment were ethanol, ethanol/benzene (volume ratio of 1:2) and ethanol/methanol (volume ratio of 1:1).

2.2. Experimental methods

2.2.1. Extraction method

The crushed and processed *Pterocarpus cambodianus* Pierre's powder was weighed 3 parts and the mass was 10 g (accuracy was 1.0 mg). A well-weighed powder and 250 mL of ethanol, ethanol/benzene (1:2 by volume) and ethanol/methanol (1:1 by volume) were added in the three round bottom flasks respectively. And then refluxed at 85 °C, 82 °C and 80 °C for 4.5 h. The obtained extract was subjected to suction filtration on a circulating water type vacuum pump (YUHUA SHZ-D (III)) using a quantitative filter paper subjected to ethanol extraction treatment for 12 h. Finally, the obtained extract was steamed and concentrated by a rotary evaporator (YUHUA RE-2000A).

2.2.2. FT-IR method

Diospyros celebica's powder and the concentrated extract refluxed by three kinds of extractants were subjected to FT-IR detection (ThermoFisher Nicolet, 670FT-IR). The scanning of each powder was collected at a spectral resolution of 4 cm^{-1} and the spectral range was 400–4000 cm^{-1} (Maruyama et al., 2001; Sukor et al., 2017).

2.2.3. TG method

The powder of Diospyros celebica was analyzed by thermogravimetric analyzer (TGA Q50 V20.8 Build 34). The carrier gas used in the experiment was high purity nitrogen and the nitrogen release rate was 60 mL/min. The temperature program of TG starts at 30 °C and rises to 250 °C at a rate of 5 °C/min. During the test, the sample's weight (%), Deriv. Weight (%/°C) were recorded (Zhang et al., 2009; Basheer et al., 2017).

2.2.4. GC–MS method

The three extracts were analyzed using a gas chromatography–mass spectrometer (Agilent GC–MS 7890B 5977A). Column HP-5MS (30 m × 250 μm × 0.25 μm). Elastic quartz capillary column, the carrier gas used for high purity helium, flow rate of 1 mL/min. The split ratio is 20:1. The temperature program of the GC starts at 50 °C, rises to 250 °C at a rate of 8 °C/min, and then rises to 300 °C at a rate of 5 °C/min. MS program scan mass range of 30–600 amu, ionization voltage of 70 eV, ionization current of 150 μA electron ionization (EI). The ion source and the quadrupole temperature were set at 230 °C and 150 °C, respectively.

2.2.5. TDS–GC–MS method

The Diospyros celebica' powder was analyzed with thermal desorption-gas chromatography-mass spectrometry. TDS starting temperature of 30 °C, for 1 min, at 10 °C/min rate rose to 100 °C, keep 5 min, then 10 °C/min rate rose to 200 °C, the transmission line temperature of 230 °C. CIS starting temperature of −50 °C, hold 0.1 min, and then 10 °C/s rate rose to 230 °C, keep 1 min. Gas Chromatography–Mass Spectrometer (Agilent GC–MS 7890B 5977A). The temperature program of the GC starts at 50 °C, rises to 250 °C at a rate of 8 °C/min, and then rises to 300 °C at a rate of 5 °C/min. MS program scan mass range of 30–600 amu, ionization voltage of 70 eV, ionization current of 150 μA electron ionization (EI). The ion source and the quadrupole temperature were set at 230 °C and 150 °C, respectively. The analytical standard library was analyzed by NIST14.L.

2.2.6. PY–GC–MS method

The powder of Diospyros celebica was analyzed by thermal cracking-gas chromatography-mass spectrometry (CDS5200-trace1310 ISQ). The carrier gas used for high purity helium, the pyrolysis temperature was 500 °C, the heating rate was 20 °C/ms, and the pyrolysis time was 15 s. The pyrolysis product transfer line and the injection valve temperature are set to 300 °C; Column TR-5MS; Capillary column (30 m × 0.25 mm × 0.25 μm); Shunt mode, split ratio of 1:60, shunt rate of 50 mL/min. The temperature of the GC program starts at 40 °C for 2 min, rises to 120 °C at a rate of 5 °C/min, and then rises to 200 C at a rate of 10 °C/min for 15 min. Ion source (EI) temperature of 280 °C, scanning range of 28–500 amu.

3. Results

3.1. FT-IR analysis

Fig. 1 shows the infrared comparison spectra of the *Pterocarpus cambodianus* Pierre powder and the three extracts. The infrared spectrum of 3360 cm^{-1} is the O—H stretching

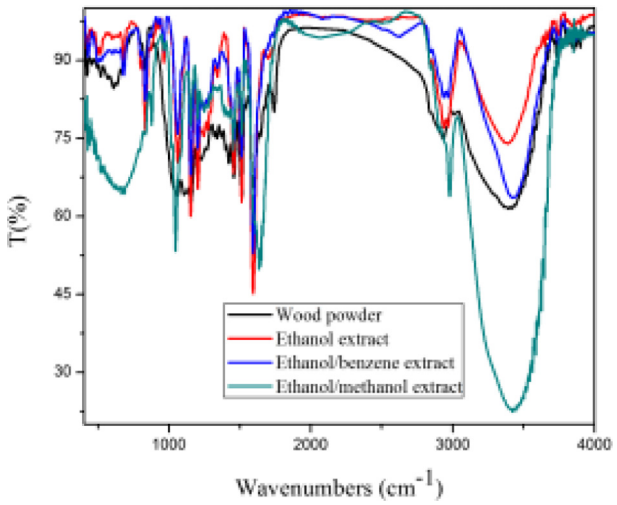

Fig. 1 FT-IR comparison spectra of *Pterocarpus cambodianus Pierre* powders and three extracts.