

## LETTER TO THE EDITOR

### Molecules of Rosewood: *Dalbergia Retusa*

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Dalbergia retusa as the research object, 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. 2-methyl-9-(prop-1-en-3-ol-2-yl)-'s brain cells have good protection and enhance function, can enhance brain memory and eliminate fatigue; 1,2-Benzenedicarboxylic acid, bis(2-methylpropyl) ester have a certain anti-cancer activity, pharmaceutical applications can be used for the synthesis of cancer drugs; Benzene, 1,2,3-trimethoxy-5-(2-propenyl)- itself has antioxidant effects, it can play an anti-inflammatory and antithrombotic effect in the human body, in addition to hyperlipidemia crowd it also has the effect of lowering blood pressure.

#### 1 Introduction

*Dalbergia retusa* Hesml's main producing areas are Mexico, Belize and Costa Rica, belonging to Leguminosae *Dalbergia*. *Dalbergia retusa*'s growth wheel is clear, heartwood section is reddish-brown, with black stripes. *Dalbergia retusa* has a high gloss, high strength, hardness, corrosion resistance, insect resistance and strong features, air dry density of 0.98-1.22 g/cm<sup>3</sup>. *Dalbergia retusa* structure is delicate, the texture is straight or staggered. *Dalbergia retusa* is often used to make high-end furniture and handicrafts (Fu et al. 2018). Traditionally, *Dalbergia retusa* is considered to be a useful timber with human health functions. Therefore, the *Dalbergia retusa* powder was analyzed by PY-GC-MS, TDS-GC-MS, TG and FT-IR; the extractives of ethanol, ethanol/benzene and ethanol/methanol in the *Dalbergia retusa* were analyzed by GC-MS and FT-IR; to determine the active molecules of *Dalbergia retusa*, figurative effect of human care function.

#### 2 Material and methods

##### 2.1 Materials

The *Dalbergia retusa* used in the experiment was produced in Mexico. The *Dalbergia retusa* used in the experiment 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 extractives 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 *Dalbergia retusa*'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 hours. The obtained extractives 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 hours. Finally, the obtained extract was steamed and concentrated by a rotary evaporator (YUHUA RE-2000A).

#### 2.2.2 *Ft-ir analysis*

*Dalbergia retusa*'s powder and the concentrated extractives refluxed by three kinds of extractants were subjected to FT-IR detection (Thermo Fisher Nicolet, 670FT-IR). The scanning of each powder was collected at a spectral resolution of 4 cm<sup>-1</sup> and the spectral range was 400 cm<sup>-1</sup>-4000 cm<sup>-1</sup> (Maruyama 2001, Xue et al. 2014, Ge et al. 2017a, 2017b, 2016, Jiang et al. 2017a, 2017b, Chen et al. 2017, Lou et al. 2017, Li et al. 2017, Peng et al. 2017a, 2017b, 2017c, 2016, 2014, 2013, 2012, 2011, Li et al. 2017a, 2017b, Awaad et al. 2017, Popiolek et al. 2017).

#### 2.2.3 *TG analysis*

The powder of *Dalbergia retusa* 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 60ml/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 were recorded (Bassilakis 2001, Xue et al. 2014, Ge et al. 2017a, 2017b, 2016, Jiang et al. 2017a, 2017b, Chen et al. 2017, Lou et al. 2017, Li et al. 2017, Yang et al. 2016, Peng et al. 2017a, 2017b, 2017c, 2016).

#### 2.2.4 *GC-MS analysis*

The three extracts were analyzed using a gas chromatography-mass spectrometer (Agilent GC-MS 7890B 5977A) (Xue et al. 2014, Ge et al. 2017a, 2017b, 2016, Jiang et al. 2017a, 2017b, Chen et al. 2017, Lou et al. 2017, Li et al. 2017, Peng et al. 2017a, 2017b, 2017c, 2016, 2014, 2013, 2012, 2011, Ouyang et al. 2017, Li et al. 2017a, 2017b, Awaad et al. 2017, Popiolek et al. 2017).

#### 2.2.5 *TDS-GC-MS analysis*

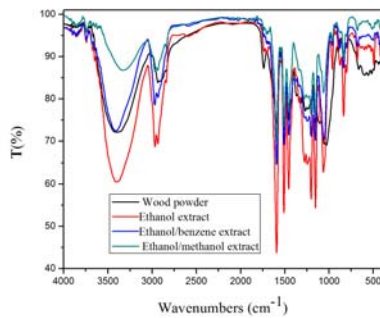
The *Dalbergia retusa*' powder was analyzed with thermal desorption-gas chromatography-mass spectrometry (Ge et al. 2017a, 2017b, Jiang et al. 2017a, 2017b, Chen et al. 2017, Lou et al. 2017, Li et al. 2017, Peng et al. 2017a, 2017b, 2017c, 2016).

#### 2.2.6 *PY-GC-MS analysis*

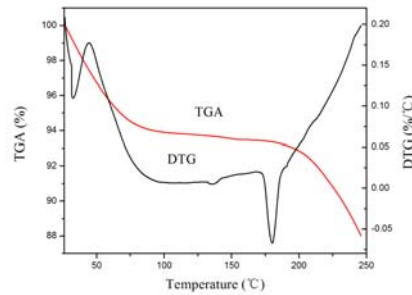
The powder of *Dalbergia retusa* was analyzed by thermal cracking-gas chromatography-mass spectrometry (CDS5200-trace1310 ISQ) (Ge et al. 2017a, 2017b, Jiang et al. 2017a, 2017b, Chen et al. 2017, Lou et al. 2017, Li et al. 2017, Peng et al. 2017a, 2017b, 2017c, 2016).

### 3 Results

#### 3.1 FT-IR analysis



**Figure 1 FT-IR Spectra.**



**Figure 2 TG curve.**

Figure 1 shows the infrared comparison spectra of the *Dalbergia retusa* powder and the three extractives. The infrared spectrum of 3360  $\text{cm}^{-1}$  is the O-H stretching vibration in the cellulose, phenol, alcohol, carboxylic acid compounds (Iwak, 2000). The infrared spectrum of 2900  $\text{cm}^{-1}$  and 1370  $\text{cm}^{-1}$  is the C-H stretching vibration and C-H bending vibration in the cellulose and hemicellulose (Ricca 2011). The infrared spectrum of 1738  $\text{cm}^{-1}$  is the C=O stretching vibration in hemicellulose, lipids, ketones (Gomti 2004, It, 2010); The 1425  $\text{cm}^{-1}$  of the infrared spectrum is the CH<sub>2</sub> bending vibration and the CH<sub>2</sub> shear vibration in the lignin and the cellulose. The infrared spectra of 1126  $\text{cm}^{-1}$  and 1033  $\text{cm}^{-1}$  are C-H aromatic in-plane bending vibrations. Infrared spectrum 817  $\text{cm}^{-1}$  is the G-ring C-H outside the bending vibration (Schlemmer 2005).

### 3.2 TG analysis

Figure 2 shows the TG curve of the *Dalbergia retusa*. 30°C-100°C temperature section in the figure, the quality of *Dalbergia retusa* change faster, mainly for water and a small amount of oil evaporation; 100°C-180°C temperature section is the continuous endothermic process of wood flour; *Dalbergia retusa* powder more violent pyrolysis reaction in the 180°C-250°C temperature, making the quality of wood powder decreased faster.

### 3.3 GC-MS analysis

A total of 49 peaks were isolated by GC-MS gas chromatographic analysis of the ethanol extract of *Dalbergia retusa*, and 15 compounds were identified. The results show that the main substances contained are: 10,11-Dihydro-10-hydroxy-2,3,6-trimethoxydibenz(b,f)oxepin (31.27%), 10,11-Dihydro-10-hydroxy-2,3-dimethoxydibenz(b,f)oxepin (4.81%),  $\alpha$ -Bisabolol (3.66%), S-Indacene-1,7-dione, 2,3,5,6-tetrahydro-3,3,4,5,5,8-hexamethyl- (1.34%), Phenol, 4-methyl-2-[5-(2-thienyl)pyrazol-3-yl]- (1.02%), 1,4-Benzenediol, 2-methoxy- (0.95%), 2(3H)-Furanone, 5-butylidihydro-4-methyl-, cis- (0.69%), 2-Naphthalenemethanol, decahydro- $\alpha,\alpha,4a$ -trimethyl-8-methylene-, [2R-(2 $\alpha,4a,\alpha,8a,\beta$ .)]- (0.32%).

A total of 43 peaks were isolated by GC-MS gas chromatographic analysis of the Ethanol/benzene extract, and 10 compounds were identified. The results show that the main substances contained are: 10,11-Dihydro-10-hydroxy-2,3,6-trimethoxydibenz(b,f)oxepin (37.58%), 10,11-Dihydro-10-hydroxy-2,3-dimethoxydibenz(b,f)oxepin (5.02%),  $\alpha$ -Bisabolol (2.09%), S-Indacene-1,7-dione, 2,3,5,6-tetrahydro-3,3,4,5,5,8-hexamethyl- (2.01%), Phenol, 4-methyl-2-[5-(2-thienyl)pyrazol-3-yl]- (1.57%), 1,4-Benzenediol, 2-methoxy- (0.9%), Hematoxylin (0.5%).

A total of 42 peaks were isolated by GC-MS gas chromatographic analysis of the Ethanol/methanol extract, and 10 compounds were identified. The results show that the main substances contained are: 10,11-Dihydro-10-hydroxy-2,3,6-trimethoxydibenz(b,f)oxepin (16.69%),  $\alpha$ -Bisabolol (3.45%), Phenol, 4-methyl-2-[5-(2-thienyl)pyrazol-3-yl]- (1.35%), S-Indacene-1,7-dione, 2,3,5,6-tetrahydro-3,3,4,5,5,8-hexamethyl- (0.89%), 10,11-Dihydro-10-hydroxy-2,3-dimethoxydibenz(b,f)oxepin (0.8%).

### 3.4 TDS-GC-MS analysis

A total of 82 peaks were isolated by TDS-GC-MS gas chromatographic analysis of *Dalbergia retusa* powder, and 37 compounds were identified.

The TDS-GC-MS results show that the main substances contained are: .alpha.-Bisabolol (12.9%), 1,2-Benzenedicarboxylic acid, bis(2-methylpropyl) ester (12.44%), 2(3H)-Furanone, 5-butylidihydro-4-methyl-, cis- (7.9%), 2-Naphthalenemethanol, decahydro-.alpha.,.alpha., 4a-trimethyl-8-methylene-, [2R-(2.alpha.,4a.alpha., 8a.beta.)]- (5.3%), Phenol, 4-methyl-2-[5-(2-thienyl)pyrazol- 3-yl]- (3.34%), Ethanol, 2-(2-butoxyethoxy)-, acetate (2.55%), Benzene, 1,2,3-trimethoxy-5-(2-propenyl)- (2.44%), 1,4-Benzenediol, 2-methoxy- (2.35%), 7-epi-cis-sesquisabinene hydrate (1.97%), 3,7,11-Trimethyl-dodeca-2,4,6,10-tetraenal (1.69%), 10,11-Dihydro-10-hydroxy-2,3,6-trimethoxydibenz(b,f)oxepin (1.51%), Furfural (1.34%), Corymbolone (1.08%), 2-Naphthalenemethanol, 1,2,3,4,4a,5,6,7-octahydro-.alpha.,.alpha.,4a,8-tetramethyl-, (2R-cis)- (0.97%).

### 3.5 PY-GC-MS analysis

The chemical constituents of *Dalbergia retusa* powder were determined by PY-GC-MS qualitative analysis technique (Gao, 2013). A total of 50 peaks were isolated by PY-GC-MS gas chromatographic analysis of *Dalbergia retusa* powder, and 15 compounds were identified. The results show that the main substances contained are: Levoglucosenone (11.81%), Acetic acid, oxo-, methyl ester (6.17%), Furfural (3.36%), Acetic acid (2.88%), 1,4:3,6-Dianhydro- $\alpha$ -D-glucopyranose (1.94%), 2-Furancarboxaldehyde, 5-methyl- (1.76%), N-Butyl-tert-butylamine (1.17%), 5-Acetoxymethyl-2-furaldehyde (1.05%), Phenol, 2,6-dimethoxy- (1.03%), 5-Hydroxymethylfurfural (0.87%).

## 4 Conclusion

GC-MS analysis, a total of 49 peaks were isolated by GC-MS gas chromatographic analysis of the ethanol extractives of *Dalbergia retusa*, and 15 compounds were identified; a total of 43 peaks were isolated by GC-MS gas chromatographic analysis of ethanol/benzene extractives, and 10 compounds were identified; a total of 42 peaks were isolated by GC-MS gas chromatographic analysis of ethanol/methanol extractives, and 10 compounds were identified.

TDS-GC-MS analysis, a total of 82 peaks were isolated by TDS-GC-MS gas chromatographic analysis of *Dalbergia retusa* powder, and 37 compounds were identified.

PY-GC-MS analysis, a total of 50 peaks were isolated by PY-GC-MS gas chromatographic analysis of *Dalbergia retusa* powder, and 15 compounds were identified.

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