MOLECULES AND INDOOR ATMOSPHERIC EFFECT OF ROSEWOOD: DALBERGIA GRANADILLO

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Dalbergia granadillo’s human health components were studied using PY-GC-MS, TDS-GC-MS, and GC-MS. The composition of known human health functions was studied by reviewing available literature. 7-Methyl-Z-tetradecen-1-olacetate has the effect of removing heat and relieving cough in the human body and effectively treat both dry cough and sore throat caused by fire; 1,2-Benzene dicarbonylic acid, bis (2-methyl propyl) ester has a certain anti-cancer activity, pharmaceutical applications can be used for the synthesis of cancer drugs.

KEYWORDS: Dalbergia granadillo; PY-GC-MS; GC-MS; TDS-GC-MS; Health care ingredients.

1. Introduction

Dalbergia granadillo Pittier’s main origin is Mexico, and the plant belongs to Leguminosae Dalbergia. D.granadillo is a diffuse porous material, with obvious growth wheel, the heart wood section is dark red and dark red with white strips. D.granadillo wood structure is delicate, the texture is straight or staggered. D.granadillo has high strength, hardness, air-dry density of 0.98-1.22 g/cm³, and it is commonly used to make high-end furniture and handcrafts. Traditionally, D.granadillo is considered edible and useful timber with human health functions [1, 2]. Therefore, the D.granadillo powder was analyzed via PY-GC-MS, TDS-GC-MS, TG, and FT-IR; the extractive components of ethanol, ethanol/benzene, and ethanol/methanol in D.granadillo were analyzed via GC-MS and FT-IR; this was done to determine the effective molecules of D.granadillo, and the figurative effect of human care function [3].

2. Material and methods

2.1. Materials

The D.granadillo used in the experiment was produced in Mexico. The D.granadillo used in the experiment are first pulverized and then tested with the obtained wood powder. The ethanol, benzene
and methanol were used in the experiments were purely chroma to graphed. 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 D. granadillo’s powder was weighed three parts and the mass was16g (accuracy was 1.0 mg). A well-weighed powder and 300 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. Then, the mixture was refluxed at 85°C, 82°C, and 80°C for 4.5 h. The obtained extractives were subjected to suction filtration on a circulating water type vacuum pump (YUHUASHZ-D(III)), using a quantitative filter paper subjected to ethanol extraction treatment for 12h. Finally, the obtained extract was steamed and concentrated via rotary evaporator (YUHUARE-2000A).

2.2.2. FT-IR analysis

D. granadillo’s powder and the concentrated extractives refluxed by three types of extractants were subjected to FT-IR detection (Thermo Fisher Nicolet, 670 FT-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 [4-10].

2.2.3. TG analysis

The powder of D. granadillo was analyzed via thermogravimetric analyzer (TGAQ50V20.8Build34). The carrier gas use din 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 increased to 250°C at a rate of 5 °C/min [11-14].

2.2.4 GC-MS analysis

The three extracts were analyzed via gas chromatography-mass spectrometer (AgilentGC-MS7890B5977A). 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 1mL/min. The split ratio is 20:1. The temperature program of the GC starts at 50°C, increased to 250°C at a rate of 8°C/min, and then in creased to 300°C at a rate of 5 °C/min. MS programs can mass range of 30-600 amu, ionization voltage of 70 eV, and ionization current of 150 μA electron ionization (EI). The ion source and the quadrupole temperature were set to 230°C and 150°C, respectively [15-18].

2.2.5 TDS-GC-MS analysis

The D. granadillo powder was analyzed via thermal desorption-gas chromatography-mass spectrometry. TDS starting temperature of 30°C, for 1min, at 10 °C/min rate rose to 100°C, keep 5 min, then 10 °C/min rate increased to 200°C, the transmission line temperature of 230°C. CIS starting temperature of -50°C, hold for 0.1 min, and then 10 °C/s rate rose to 230°C, keep for 1 min. Measurements were conducted via Gas Chromatography-Mass Spectrometer
(Agilent GC-MS7890B5977A). The temperature program of the GC starts at 50°C, increased to 250°C at a rate of 8 °C/min, and then increased 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 to 230°C and 150°C, respectively. The analytical standard library was analyzed via NIST14.L [19-21].

2.2.6 PY-GC-MS analysis

The powder of *D. granadillo* was analyzed via thermal cracking-gas chromatography-mass spectrometry (CDS5200-trace 1310ISQ). The carrier gas used was 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 were 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 2min, increased to 120°C at a rate of 5°C/min, and then increased to 200°C at a rate of 10 °C/min for 15min. Ion source (EI) temperature of 280°C, scanning range of 28-500 amu [22-24].

3. Results

3.1. FT-IR analysis

![Figure 1](image-url) FT-IR spectra of *D. granadillo* powders and three extracts.

Figure 1 shows the infrared comparison spectra of the *D. granadillo* powder and the three extracts. The infrared spectrum of 3360 cm⁻¹ is the O-H stretching vibration in the cellulose, phenol, alcohol, and carboxylic acid compounds [25, 26]. The infrared spectrum of 2900 cm⁻¹ is C-H stretching vibration and C-H bending vibration in cellulose and hemicellulose [27]. The infrared spectrum of 1738 cm⁻¹ is the C=O stretching vibration in hemicellulose, lipids, ketones [28]. At 1600 cm⁻¹ is the lignin aromatic carbon skeleton on vibration. The 1425 cm⁻¹ of the infrared spectrum is the CH₂ bending vibration and the CH₂ shearing vibration in the lignin and the cellulose. The infrared spectra of 1126 cm⁻¹ and 1033 cm⁻¹ are C-H aromatic-plane bending vibrations. The infrared spectrum 817 cm⁻¹ is the G-ring C-H outside the bending vibration [29].
3.2 TG analysis

Figure 2: D.granadillo’s TG curve.

Figure 2 shows that the TG curve of the D.granadillo. 30-75°C temperatures ectionin Figure 2, the quality of D.granadillo changes faster, mainly due to water and a small amount of oil evaporation; 75-150°C temperatures ectionis the continuou send other micprocess of wood flour; D.granadillo more violent pyrolysis reaction in the 150-250°C temperature, leading to a faster decrease of the quality of wood powder.

3.3 GC-MS analysis

Figure 3: Total ion chromatogram of ethanol extractives of D.granadillo.

Figure 4: Total ion chromatogram of ethanol/benzene extractives of D.granadillo.
Retention (min)

Figure 5 Total ion chromatogram of ethanol/methano extractives of *D.granadillo*.

Figures.3-5 show the total ion chromatograms of the extractives of ethanol, ethanol/benzene, and ethanol/methano, respectively.

The chemical constituents of three extracts of *D.granadillo* were determined via GC-MS qualitative analysis technique [30]. A total of 51 peaks were isolated via GC-MS gas chromatographic analysis of the ethanol extract of *D.granadillo*, and nine compounds were identified [31]. The results show that the components are: 2H-1-benzopyran-2-one, 7-hydroxy-3-(4-methoxyphenyl)-(7.71%), 3, 3’, 4, 4’-Tetramethoxystilbene (5.01%), 10, 11-Dihydro-10-hydroxy-2, 3, 6-trimethoxydibenz (b,f) oxepin (2.12%), Phenol, p-1-indanyl-(0.75%), cis-Trismethoxylesveratrol (0.56%), and 1,4-Benzenediol,2-methoxy-(0.24%).

A total of 70 peaks were found via GC-MS gas chromatographic analysis of the ethanol/benzene extract, and 14 compounds were identified. The results show that the components mainly are: 10, 11-Dihydro-10-hydroxy-2, 3, 6-trimethoxydibenz(b,f)oxepin (7.7%), 3, 3’, 4, 4’-Tetramethoxystilbene (3.09%), S-Indacene-1, 7-dione, 2, 3, 5, 6-tetrahydro-3, 3, 4, 5, 5, 8-hexamethyl- (1.37%), Phenol, p-1-indanyl-(0.9%), and 4-Methoxybenzene-1, 2-diol (0.44%).

A total of 61 peaks were isolated via GC-MS gas chromatographic analysis of the ethanol/methanol extract, and 10 compounds were identified. The results show that the components mainly are: 3, 3’, 4, 4’-Tetramethoxystilbene(2.85%), Tricyclo [4.4.0.0(2,7)] dec-8-ene-3-methanol, alpha., alpha., 6, 8-tetramethyl-, stereoisomer (1.33%), S-Indacene-1, 7-dione, 2, 3, 5, 6-tetrahydro-3, 3, 4, 5, 5, 8-hexamethyl-(1.12%), Phenol, p-1-indanyl-(0.68%), cis-Trismethoxylesveratrol (0.62%), and 2-Naphthalenemethanol, decahydro-. alpha., alpha., 4a-trimethyl-8-methylene-, [2R-(2.alpha.,4a.alpha.,8a.beta.)]- (0.35%).

3.4 TDS-GC-MS analysis

Figure 6 Total ion chromatogram of *D.granadillo* powder
Figure 6 shows the total ion chromatogram of the D.granadillo powder. The chemical constituents of D.granadillo powder were determined by TDS-GC-MS qualitative analysis technique [32]. A total of 73 peaks were isolated via TDS-GC-MS gas chromato graphic analysis of D.granadillo powder, and 40 compounds were identified.

3.5 PY-GC-MS analysis

Figure 7 shows the relative abundance curve of the D.granadillo powder. The chemical constituents of D.granadillo powder were determined via PY-GC-MS qualitative analysis technique [33]. A total of 50 peaks were isolated via PY-GC-MS gas chromato graphic analysis of Dalbergiagranadillo powder, and 16 compounds were identified.

4. Discussion

D.granadillo’s human health function. The PY-GC-MS, TDS-GC-MS, and GC-MS techniques were used to qualitatively analyze D.granadillo, and the related compounds were obtained. Cinnamaldehyde, (E)-has strong acaricidal activity, in addition to the ticks pecies of larvae also achieve high killing [34]; Phenol, 2-methoxy-3-(2-propenyl)-in antibacterial, showing high antibacterial activity; Propanoic acid, 2-methyl-, 3-hydroxy-2, 2,4-trimethylpentylester has detoxification, cough, and expect orantand reinforcing the effect of blood. Blood can be used to treat acute and chronic bronchitis, pharyngitis, and tonsillitis [35, 36]; Benzene, 1,2,3-trimethoxy-5-(2-propenyl)-itself has antioxidant effects, and can play an anti-inflammatory and antithrombotic effect in the human body, in addition to hyperlipidemia crowd it also has the effect to flowering blood pressure [37]; Cedrol has a clear sedative effect on the emotional stability has a certain role in promoting [38]; 7-Methyl-Z-tetradecen-1-ol acetate has the effect of removing heat and relieving cough in the human body and effectively treating dry cough and sore throat caused by fire [39]; 1,2-Benzenedicarboxylic acid,bis(2-methylpropyl) ester have a certain anti-canceractivity, and pharmaceutical applications can be used for the synthesis of cancer drugs [40].

5. Conclusion

A total of 51 peaks were isolated via GC-MS gaschroma to graphicanalysis of the ethanol extractives of Dalbergiagranadillo, and none compounds were identified; a total of 70 peaks were isolated via GC-MS gaschroma to graphicanalysis of ethanol/benzene extractives, and 14 compounds were identified; a total of 61 peaks were isolated via GC-MS gaschroma to graphic analysis of ethanol/methanol extractives, and 10 compounds were identified.
A total of 73 peaks were isolated via TDS-GC-MS gas chroma to graphic analysis of *D.granadillo* powder, and 40 compounds were identified.

Through access to the literature and relevant reports, we clarified that *D.granadillo* contains human health in ingredients and functions. Cedrol has a clear sedative effect on the emotional stability has a certain role in promoting; 7-Methyl-Z-tetradecen-1-olacetate has the effect of removing heat and relieving cough in the human body and effectively treating the dry cough and sore throat caused by fire; 1,2-Benzenedicarboxylic acid, bis(2methylpropyl) ester have a certain anti-cancer activity, pharmaceutical applications can be used for the synthesis of cancer drugs.

**Acknowledgments**

This research was supported by The Hunan Science Fund for Distinguished Young Scholars (16JJ1028), the major scientific and technological achievements transformation projects of strategy ice merging industries in Hunan Province (2016GK4045), and the academiian reserve personnel training plan of lift engineering technical personnel of Hunan Science and Technology Association (2017TJ-Y10).

**References**


