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LETTER TO THE EDITOR

Comparative Analysis of Three Kinds of Shrubs by TG, FTIR, GC-MS and TDS-GC-MS

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Three kinds of wood, Prunus trilobata, Hong Ji Mu and Huang Jing Mu, were selected as the research objects. TG, FT-IR and GC-MS) And thermal desorption-gas chromatography-mass spectrometry (TDS-GC-MS) were used to analyze the organic solvent extracts from three kinds of wood. The statistical methods were used to establish the TG and FT-IR fingerprints and the GC-MS chemical composition analysis tables of all kinds of wood respectively, and then the comparative analysis was conducted. The results showed that the three kinds of wood TG maps and FTIR fingerprints of the overall trend of consistency, however, there are differences in details. These differences are conducive to the future division and reasonable combination of the three types of timber in the scientific use of the three types of timber resources. At the same time, GC-MS was used to compare and analyze the chemical compositions of the three woods. The results showed that the chemical compositions of the three woods were similar, and the three kinds of wood had a significant role in the fields of medicine and so on. Through the GC-MS analysis of three kinds of wood, it is beneficial to the application in the fields of medicine, fragrance, chemical industry and fine chemical industry, which provides the basis for more scientific utilization of three kinds of wood resources in the future. According to the result of TD-GC-MS analysis, it helps us understand the three kinds of wood ingredients, as well as the functional, pros and cons of the ingredients. Thus, in the future can be more scientific, healthy, reasonable use of these three kinds of wood.

1 Introduction

Ligustrum quihoui Carr is a small shrub belonging to the genus Oleaceae, which is produced in most parts of China and is easy to survive and grow rapidly. In this study, wood samples were extracted with Ligustrum quihoui Carr, Loropetalum chinense var.Rubrum and Vitex negundo L and their fingerprints were analyzed by thermogravimetry (TG) and Fourier transform infrared spectroscopy (FT-IR) At the same time, we analyzed the similarities and differences between the three wood samples by gas chromatography-mass spectrometry (GC-MS) Chemical industry, medicine, fine chemicals, spices and other fields in the application prospects.

2 Experimental materials and methods

Material

Three kinds of wood were collected from Changsha, Hunan, Central South University of Forestry and Technology. Selected chemical reagents are ethanol, ethanol ethyl acetate (volume ratio of 1:1:1), ethanol methanol (volume ratio of 1:1).

3 Experimental results and analysis

3.1 Study on TG/DTG thermal curve analysis of three timber

3.1.1 TG/DTG Thermal Curve Analysis of Ligustrum quihoui Carr

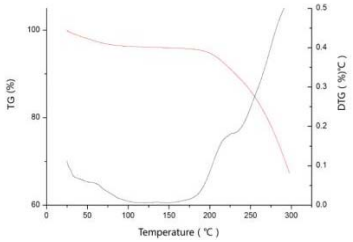

Figure 1 TG/DTG curve of Ligustrum quihoui Carr

As can be seen from Figure 1, the wood samples through three stages, the first stage: from room temperature to 100°C, TG curve has a small arc down, DTG thermal degradation rate curve from a certain degree of development tends to be gentle, is the evaporation stage after the absorption Hot water. The second stage: From 100°C to 200°C, the TG curve and DTG curve of wood samples all tend to be gentle. Stage 3: At 200°C to 300°C, the TG curve of the wood samples dropped sharply at this stage and the DTG curve rose sharply due to the declining hemicellulose and cellulose in the wood samples, resulting in low Molecular carbohydrates pyrolysis easier.

3.1.2 TG/DTG Thermal Curve Analysis of Loropetalum chinense var.rubrum

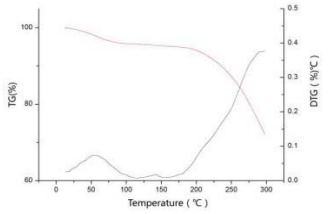

Figure 2 TG/DTG curves for Loropetalum chinense var.rubrum

As can be seen from Figure 2, the wood samples through three stages, the first stage: from room temperature to 100°C, TG curve changes with a small curvature, DTG curve showed a small peak at this stage the thermal degradation rate of wood samples from small to large Redevelopment tends to be gentle. The second stage: From 100°C to 150°C, the TG curve and DTG curve of wood samples tend to be gentle. The third stage: at 150°C to 300°C, the TG curve of wood samples dropped sharply at this stage, the DTG curve rose sharply and then leveled off. The pyrolysis rate of low-molecular carbohydrates in wood samples began to increase rapidly, after the value was uniform increase.

3.1.3 TG/DTG Thermal Curve Analysis of Vitex negundo L.

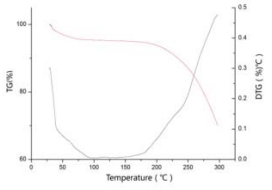

Figure 3 TG/DTG curves of Vitex negundo L.

As can be seen from Figure 3, the wood samples through three stages, first stage: from room temperature to 80°C, TG curve with a small arc down, DTG curve showed a downward trend in this stage the thermal degradation of wood samples from large to large Small redevelopment tends to be gentle. The second stage: From 80°C to 150°C, the TG curve and DTG curve of wood samples all tend to be gentle. The third stage: between 150°C and 300°C, the TG curve of wood samples evolved from a slow decline to a sharp decline at this stage. The DTG curve developed from a slow

rise to a sharp rise, and the rate of low-molecular carbohydrate pyrolysis in the wood samples kept constant Increase.

3.2 FT-IR analysis of three kinds of wood

3.2.1 FT-IR analysis of Ligustrum quihoui Carr

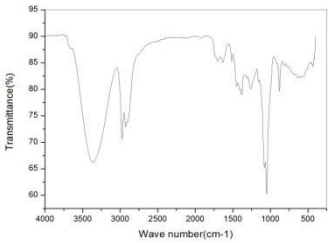

Figure 4. FTIR fingerprint of Ligustrum quihoui Carr extractives

As can be seen from Figure 4, after the extraction experiment, the characteristic absorption peaks of cellulose did not change significantly at 2100 cm^{-1}, 4170 cm^{-1} and 5200 cm^{-1}, but the absorption intensity decreased, indicating that the cellulose chemistry The content of the characteristic absorption peak of hemicellulose did not change obviously at 1770 cm^{-1}, 3200 cm^{-1}, 5300 cm^{-1}, but the intensity at 4720 cm^{-1} obviously decreased, indicating that half Cellulose partially hydrolyzed. The characteristic absorption peak of lignin did not change obviously at 1720 cm^{-1}, 2000 cm^{-1}, 1002 cm^{-1} and 1200 cm^{-1}, and the absorption intensity at 2255 cm^{-1} After the lignin was partially hydrolyzed, the absorption peak at 2656 cm-1 disappeared, which indicated that the hydrocarbon compounds were partly extracted in the extraction experiment and the chemical composition changed.

3.2.2 FT-IR analysis of Loropetalum chinense var.rubrum

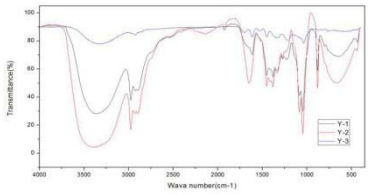

Figure 5. FTIR fingerprint of Loropetalum chinense var.rubrum organic solvent extractives

The curves Y-1, Y-2 and Y-3 in Figure 5 represent the FTIR fingerprints of ethanol-ethyl acetate (1:1:1 by volume) Map. From Figure 5, the FTIR fingerprints of the three organic solvent extracts showed similarities but also showed differences. FT-IR curve of ethanol-methanol organic solvent extract showed the least change, and ethanol-organic solvent extract FT-IR curve changes the most. The absorption peaks of red and wood organic solvent extracts are mainly in the wave bands of 3570 cm^{-1}-4000 cm^{-1}, 3000 cm^{-1}-3070 cm^{-1}, 1770 cm^{-1}-2500 cm^{-1} and 720 cm^{-1}-970 cm^{-1}. The corresponding main chemical components are phenols, alcohols, ethers, Lipids, Aromatic and Hydrocarbons.

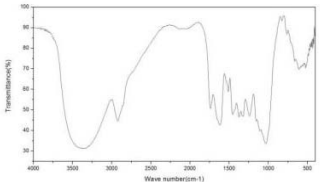

Figure 6. FTIR fingerprint of Loropetalum chinense var.rubrum extractives

As can be seen from Figure 6 , after the extraction experiment, the characteristic absorption peaks of cellulose did not change obviously at 220 cm^{-1}, 510 cm^{-1}, 1150 cm^{-1} and 1570 cm^{-1}, but the absorption intensity decreased, The chemical composition was almost unchanged and was slightly

hydrolyzed; the characteristic absorption peak of hemicellulose did not change significantly at 770 cm^{-1}, 700 cm^{-1}, but the intensity at 810 cm^{-1} obviously decreased, indicating that the hemicellulose fraction was The results showed that the absorption peak of lignin did not change obviously at 1810 cm^{-1}, 2000 cm^{-1}, 200 cm^{-1} and 2770 cm^{-1}, and the absorption intensity at 2800 cm^{-1}. The absorption peak at 3440 cm^{-1} of the partially hydrolyzed hydrocarbon disappeared, indicating that the hydrocarbon compounds were partially extracted in the extraction experiment and the chemical composition changed.

3.2.3 FT-IR analysis of Vitex negundo L.

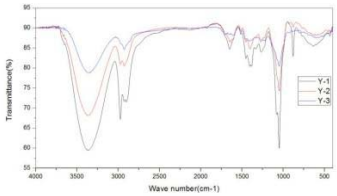

Figure 7. FTIR fingerprint of Vitex negundo wood organic solvent extractives

The curves Y-1, Y-2 and Y-3 in Figure 7 represent the FTIR fingerprints of organic solvent extracts of ethanol, ethanol and methanol (volume ratio of 1:1) and ethyl alcohol and ethyl acetate Map. As can be seen from Figure 7, the FTIR fingerprints of the three organic solvent extracts show a similar trend, but there are also differences in the FTIR fingerprints. The FT-IR curve of the organic solvent extract of ethyl alcohol and ethyl acetate shows the least change. Extract FT-IR curve changes the most. Huang Jingmu organic solvent extract peak absorption mainly concentrated in 3600 cm^{-1}-4000 cm^{-1}, 1770 cm^{-1}-2700 cm^{-1} and 720 cm^{-1}-1000 cm^{-1} wave number of these several bands, the corresponding main chemical components are aromatic, acids, ketones, aldehydes, alcohols, Alkanes, phenols and ethers.

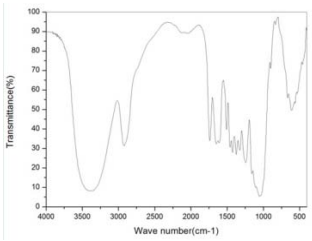

Figure 8. FTIR fingerprint of Vitex negundo wood extractives

As can be seen from Figure 8 , after the extraction experiment, the characteristic absorption peaks of cellulose did not change significantly at 250 cm^{-1}, 1170 cm^{-1} and 1650 cm^{-1} and 3100 cm^{-1}, but the absorption intensity decreased The chemical composition of cellulose did not change and was a small amount of hydrolysis; hemicellulose characteristic absorption peak at 720 cm^{-1},850 cm^{-1} at the absorption peak did not change significantly, but at 870 cm^{-1} intensity significantly weakened, indicating hemicellulose And some of them were hydrolyzed. The characteristic absorption peak of lignin did not change obviously at 1770 cm^{-1}, 2000 cm^{-1} and 2270 cm^{-1}, and the absorption intensity at 2400 cm^{-1} weakened obviously, which indicated that the part of lignin Hydrolyzed hydrocarbon compounds at 3400 cm^{-1} absorption peak disappear, indicating that hydrocarbons in the extraction experiment was partially extracted, and the chemical composition changes.

3.3 GC-MS Analysis of Three Wood Extracts

3.3.1 GC-MS Analysis of Components of Ligustrum quihoui Carr Extracts

The chemicals used in this study were ethanol, ethanol/methanol (1:1:1 by volume) and ethanol/ethyl acetate (1:1 by volume). Wood flour samples of ethanol, ethanol/methanol, ethanol/ethyl acetate extract were named Y-1, Y-2 and Y-3, respectively, and then determined by GC-MS. 40 compounds were finally identified and the relative content of each chemical composition was calculated by area normalization .

The results of GC-MS analysis showed that the chemical constituents of Ligustrum quihoui Carr extract mainly include CONIFERYL ALCOHOL, Palmitic acid, Sinapyl alcohol, Oleic Acid, Palmitamide, Oleamide, Melezitose,.gamma.-Sitosterol, 5-Hydroxymethylfurfural, Lupeol, 1 - Propyl-3,6-diazahomoadamantan-9-ol.

3.4 TDS-GC-MS analysis of three kinds of wood

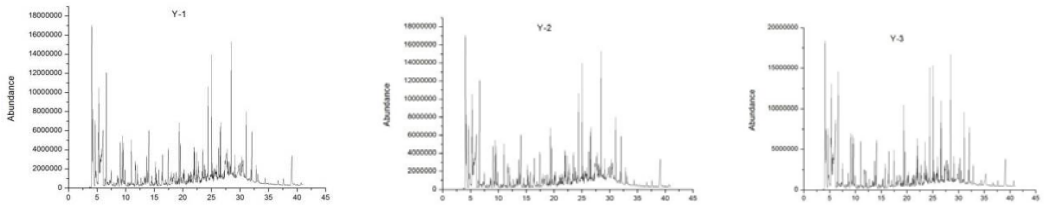

Figure 9. Total ion current map of three kinds of wood

TDS-GC-MS analysis showed the molecular distribution of the three species of wood. The retention times of the different components in the three wood volatiles show a similar trend. For the Ligustrum quihoui Carr samples, the percentage of retention times of less than 5, 10, 15 minutes and more than 15 minutes were 22.44%, 21.95%, 9.80% and 45.81%, respectively.

Acknowledgements

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