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SHORT COMMUNICATION

Gas Chromatography-Mass Spectrometry study of the pulp of *Garcinia tinctoria* fruit

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Abstract

The aim of this work was to identify the compounds in the hexane extract of the mature fruits of *Garcinia tinctoria* by means of capillary gas chromatography-mass spectrometry (GC-MS). The study allowed identifying 51 chromatographic peaks. The mass spectra allowed the identification of 20 paraffins, 13 carboxylic acids and 15 phenolic and/or alcoholic compounds in the volatile fraction of hexane extract of pulp. The major compounds were: the stearic, palmitic and oleic acids.

Key words: Clusiaceae, *Garcinia tinctoria*, GC-MS

Introduction

The large tropical genus *Garcinia* (Clusiaceae) contains about 400 species of polygamous trees or shrubs, distributed in the tropical Asia, Africa and Polynesia (Chattopadhyay and Kumar, 2006). *Garcinia* species are characterized by the production of a yellow latex in the endocarp of the fruit, in the bark and perhaps also in the wood (Negi et al., 2008). Fruits of *Garcinia* can be widely used for many culinary purposes and as folk medicine to treat skin infections, wounds, and diarrhea (Mahabusarakam, et al., 1987; Joseph et al., 2005).

Garcinia is well known as a rich source of bioactive compounds such as xanthones (Komguem et al., 2005; Ali et al., 2005; Quan-Bin et al., 2008), benzophenones (Harrison et al., 2005; Pereira et al., 2010) and biflavonoids (Deachathai et al., 2005; Okunji et al., 2007). Secondary metabolites of *Garcinia* species have shown antioxidant, antibacterial and antitumoral activities (Xing-Cong et al., 2004; Verdi et al., 2004; Rui-Min et al., 2009; Jawed et al., 2010).

G. tinctoria (Wight) is an important under-utilized crop distributed in the lower hills of Eastern Himalayas, Western Ghats and Andaman Islands (Rema and Krishnamoorthy, 2000). *G. tinctoria* is well known as yellow mangosteen and its fruits are highly acidic and are used to flavour curries. The dried fruits and leaves have been used widely as a traditional folk medicine for bilious condition, diarrhea, and dysentery (Pedraza-Chaverri et al., 2008).

There is little information about the chemical composition of *G. tinctoria* (yellow mangosteen) fruits. In this work the compounds from the hexane extract of the mature fruits of *Garcinia tinctoria* were identified using GC-MS.

Materials and Methods

Plant material

Fresh mature fruits of *Garcinia tinctoria* were collected in the Jardín Botánico Nacional (Habana, Cuba) in February-April 2012. A voucher specimen has been deposited at HAJB Herbarium (Havana, Cuba) under number 700.

Sample preparation and extraction

Fruits were washed and peeled in order to separate the peels from pulps and seeds. Pulp was ground into a paste using a mortar and pestle and it was preserved in refrigeration (4°C) until the moment of utilization. In order to evaluate chemical composition of the apolar extract of *Garcinia tinctoria* fruits pulp, it was prepared maceration (1g of pulp) with enough hexane during 7 days at room

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temperature. Sample was filtered using Whatmann No. 4 filter paper and concentrated under reduced pressure at 45°C using a rotary vacuum evaporator. The dried extract was weighed and stored until the analysis moment.

Determination of the components from the hexane extract

It was weighed 10 mg of the extract and was dissolved in 0.5 mL of internal standard solution (tridecanoic acid at 0.05 mg/mL in chloroform, Sigma, USA). The solution was derivatized with 100 µL of N metil N trimetilsililtrifluoroacetamide (MSTFA, Sigma, USA) to 70°C during 30 min in a dry thermostat Multiblock and flow control (LabLine Instruments Inc., EE UU).

Sample was separated on a HP-5 Ms 30 m x 0.25 mm installed on a gas chromatograph 6890N with a mass detector 5975 (Agilent, EE UU).

The temperature was programmed as follows: isothermic initial 60°C for 2 min, then temperature was increased up to 200°C at 20°C/min, of 200°C up to 320 at 8°C/min, and isothermic final at 320 for 30 min. The carrier gas was helium at a flow rate of 1.0 mL/min. Injector temperature was 320°C. The energy of ionization was of 70 eV. Mass spectra were obtained in mode scan since 40 to 800 m/z. The volume of injection was of 0.5 µL.

Identification was made by comparison of retention times (tr) and spectra from available commercial standards and similar compound spectra at the libraries Wiley MS, 6[a] ed. and NIST 11.The quantification was made using internal standard.

Statistical analysis

Three independent analyses were done on five samples. Statistical analysis was performed by Mann - Whitney U Test.

Results and Discussion

Identification of the constituents from the apolar extract of pulp

The analysis of the apolar extract of *G. tinctoria* allowed identifying fifty one compounds. The compounds, their percentages and retention times are listed in Table 1. Three compounds were identified as the major constituents: stearic acid (21.72%), palmitic acid (20.31%) and oleic acid (19.32%) and these represented approximately 61% of all the compounds of the fraction.

Table 1. Constituents of *Garcinia tinctoria* pulp.

Components *	RT	%±SD
Lactic acid	7.382	1.702 ± 0.081
Hexanoic acid	7.688	0.273 ± 0.010
Citronellal	8.274	0.984 ± 0.008
2-Hydroxyphenol	8.731	0.979 ± 0.009
2-Hydroxyphenol (isomer)	8.776	0.237 ± 0.002
Benzoic acid	9.091	0.295 ± 0.004
Catechol	9.669	0.327 ± 0.007
etil 2-butiletoxy	9.766	1.997± 0.092
Nonanoic acid	9.905	0.162 ± 0.005
Capric acid	10.561	0.237 ± 0.005
3-Hydroxy-benzoic acid	11.291	0.216 ± 0.006
Hexadecane	11.452	0.119 ± 0.010
Lauric acid	11,806	0.842 ± 0.013
Heptadecane	12,115	0.228 ± 0.016
Octadecane	12,820	0.259 ± 0.012
3,4-dihydroxy-benzoic acid	13,077	3.757 ± 0.162
Myristic acid	13.197	1.755 ± 0.113
Nonadecane	13,577	0.272 ± 0.008
Pentadecanoic acid	13,972	0.553 ± 0.009
1-hexadecanol	14,071	0.662 ± 0.010
Eicosane	14,390	0.332 ± 0.007
Palmitoleic acid	14,601	0.925 ± 0.015
Palmitoleic acid (isomer)	14,726	1.994 ± 0.018
Palmitic acid	14,807	20.314 ± 0.042
Henicosane	15,250	0.392 ± 0.008
Margaric acid	15,662	0.443 ± 0.007
1-octadecanol	15,764	0.887 ± 0.015
Docosane	16,139	0.678 ± 0.010
Linoleic acid	16,295	0.629 ± 0.009
Oleic acid	16,341	19.320 ± 0.032
Oleic acid (isomer)	16,489	3.779 ± 0.015
Stearic acid	16,565	21.716 ± 0.060
Tricosane	17,044	0.457 ± 0.008
Tetracosane	17,955	0.627 ± 0.012
Eicosanoic acid	18,359	0.660 ± 0.018
Pentacosane	18,861	0.645 ± 0.021
Hexacosane	19,756	1.054± 0.054
Docosanoic acid	20,127	0.420 ± 0.008
Heptacosane	20,633	0.637 ± 0.023
NI	21,462	0.597 ± 0.019
Octacosane	21.475	0.613 ± 0.022
Squalene	21,802	1.032 ± 0.061
Nonacosane	22,326	0.620 ± 0.030
Triacontane	23,136	0.403 ± 0.010
NI	23,197	1.797 ± 0.058
Henatriacontane	23,929	0.459 ± 0.009
1-Octacosanol	24,276	0.769 ± 0.018
Sterol (cholesterol)	24,585	0.530 ± 0.012
Tetratriacontane	25,445	0.258 ± 0.009
1-Triacontanol	25.760	0.438 ± 0.011
Sterol (NI)	26,540	0.722 ± 0.060

*Components are listed in order of elution on HP-5 (30 m) column, NI: not identified [a] FID area percents were corrected to wt % according to total weight. Data are the means + SD of five experiments performed in triplicate.

Ajayi and Adesanwo (2009) reported that the principal fatty acids of pulp and seed of *Dacryodes edulis* were oleic and palmitic acids. Oleic acid is the most widely distributed fatty acid on nature and it's the principal responsible of health benefits of the Mediterranean diet. Some investigations have demonstrated that oleic acid can reduce the risk to suffer breast cancer and other diseases (Win, 2005).

Other compounds detected were oleic acid isomer (3.78%); 3,4-dihydroxibenzoic acid (3.76%); eter 2-butoxy etinil (1.99%); palmitoleic acid isomer (1.99%); miristic acid (1.75%), lactic acid (1.70%) and unidentified sterol (0.72%) by the data base.

The abundance of fatty acids could contribute to acidity that characterizes the fruits of *Garcinia* species, particularly *Garcinia tinctoria* (Cavalcante et al., 2006; Rittirut and Siripatana, 2006). In a chemical study of volatile constituents of *Garcinia dulcis* fruits using gas chromatography (Pino et al., 2003), it was reported a higher amounts of fatty acids that could be responsible for the acidic and pungent notes observed in fruit.

In general, it's was observed that most of compounds are derived of paraffins with different degrees of oxidation. The composition of the classes of compounds was as follows: organic acids (22%); phenols (15%); alcohols (11%) and others (13%). The presence of phenols corresponds with the antioxidant activity detected in *G. tinctoria* using techniques like DPPH y FRAP (Arazo et al., 2012). Numerous investigations have determined the ability of the extracts from fruits of *Garcinia* species to capture free radicals (Yu et al., 2007; Okonogi et al., 2007; Sulaiman and Udaya, 2009).

Very few studies on the composition of volatile compounds in *Garcinia* genus have been accomplished (Pino et al., 2003). However, there are no data in the literature concerning the possible pharmacological effects and the chemical constituents of this plant.

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