VOLATILE COMPONENTS OF *Borassus aethiopum L*

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Résumé : L'hydrodistillation et l'extraction au dichlorométhane de la pulpe des fruits de *Borassus aethiopum* ont fourni l'huile essentielle (0.7%) et la concrète (1.3%). La composition chimique des extraits volatils est déterminée par chromatographie en phase gazeuse et par couplage chromatographie gazeuse/spectrométrie de masse. 59 composants chimiques représentant 85% de l'huile essentielle et 83.8% de la concrète, ont été identifiés. Le cinnamate d'éthyle et le géranylacétone représentent 29% de l'huile essentielle, tandis que le farnésylacétone constitue à lui seul 27.8% de l'extrait chlorométhylénique.

Mots-clés : *Borassus aethiopum*, composants volatils, cinnamate d'éthyle, géranylacétone, farnésylacétone.

I - INTRODUCTION

Borassus aethiopum L (locally known as "delib" in chadian Arab, or "mar" in Sara language) is a tall palm growing wild throughout the southern part of Chad. The fruit is roughly spherical weighing between 1 and 2 kg and covered by a thick orange skin surrounded at the base by enlarged calyces. The edible portion of the fruit is a fibrous but juicy and sugar orange pulp contained within it two or three large stones which constitute about 50% of the fruit [1]. It has a sweet but quite pleasant aroma which is used for the preparation of vegetable.

The previous works about *B. aethiopum* concerned the investigation of the steam distillate of pulp of the species from Sudan [2]. These

species were mainly characterized of C_1 to C_4 aliphatic alcohols and the corresponding acids together with esters derived from them ; the other constituents were 6-methyl-5-hepten-2-one, the corresponding alcohol and geranylacetone.

We report on the analysis of the essential oil and the methylene chloride extract of the pulp of *B. aethiopum* of Chad.

EXPERIMENTAL

Plant material - Ripe but sound fruits (10kg) of *B.aethiopum* were collected from three individual trees growing in Mayo Kebby department (Southern Chad) in February 1999.

Isolation of volatiles - The pulp (500g), from several fruits was extracted, chopped into small pieces and submitted to hydrodistillation for 2 h. to give an orange essential oil. Elsewhere, 250 g of the pulp sample were extracted at room temperature for 7 days with methylene chloride to give an amorphous orange residue.

GC - The analyses were performed on a Perkin Elmer system equipped with FID and connected with an electronic integrator Penelson, Model 1020 with a capillary column with DB1. Analytical conditions were as fellows: injector and detector temperature 230°C ; oven temperature programmed 50°C to 250°C at 3°C /min ; carrier gas: azote at 1.0 mL/min.

The percentage composition of the extract samples was computed from the peak areas without using correction for response factors.

GC/MS - Combined CG/MS was carried out on a Hewlett-Packard instrument using a fused silica capillary column (30 m x 0.23 mm x 0.15 m.) with DB-5 bonded phase. The oven temperature was held at 50°C for 2 mun. and then programmed to increase at 3°C/min. to 250°C; the carrier gas was helium with a flow rate at 1.0 mL/min. and the injector temperature was 220°C. The detector of the mass spectrometry was a quadrupole system (electron energy : 70 eV).

Identification of the Components - The volatile constituents were identified by their retention indices and by comparison of the mass spectra with those of authentic compounds or with those from literature and computer databases [3] [4] [5] [6].

RESULTS AND DISCUSSION

The essential oil yield of the samples ranged from 0.5% to 0.7%. Methylene chloride extracts gave 1.3% of residue. Table I showed the quantitative composition of the volatile extracts. The essential oil was characterized by (E)-ethyl cinnamate (18.4%) and geranylacetone (10.5%) with lesser amounts of 3-phenylpropanol (8.6%) and farnesylacetone (5%). The latter component was the main constituent (27.8%) of the organic solvent extract. The other constituents of the extract were butanoic acid (10.8%) and 3-phenylpropanol (9.1%). As the samples from Sudan [2], these from Chad contained also alcohols (17.1%), acids (5.9%) and esters (30.7%). In addition to (E)-ethyl cinnamate, the other main esters were ethyl 3-hydroxybutanoate (3.4%), ethyl 3-phenyl propanoate (2.7%), ethyl benzoate (1.7%), (E)-methyl cinnamate (0.8%), ethyl 3-hydroxyisohexanoate (0.6%) and phenylethyl tiglate (0.6%). We believe that the richness of ester compounds in the essential oil contributed greatly to the pleasant odor of the ripe fruits of *B. aethiopum*.

In conclusion, it can be stated that the presence of (E)-ethyl cinnamate in the essential oil of *B. aethiopum* was the most striking difference noticed on comparison of the essential oil of samples from Sudan. Most of the components identified in the samples from Chad were not previously known to be present in the volatile extracts of *B. aethiopum*. These compositional differences may be chemotaxonomically significant.

TABLEAU 1 : *Composition of Borassus aethiopum grown in Chad.*

RI	CONSTITUENT	ESSENTIEL OIL	EXTRACT
803	ethyl acrylate	0.1	2.1
840	butanoic acid	1.5	10.8
865	2-methyl butanoic acid	0.1	-
905	pentanoic acid	0.2	-
935	ethyl 3-hydroxybutanoate	3.4	3.3
940	3-methylpentanoic acid	0.4	-
955	benzaldehyde	0.1	-
973	3-methylthiopropanol	0.7	-
975	4-methylpentanoic acid	0.3	-
1008	hexanoic acid	1.7	-
1020	benzylic alcohol	2.8	3.2
1050	-hexalactone	0.1	-
1060	2-acetylpyrole	0.1	-
1067	benzyl formiate	0.2	-
1080	γ-hexalactone	0.2	0.9
1091	heptanoic acid	0.6	-
1093	ethyl 3-methylthiopropanoate	0.1	-
1098	6-methyl-3,5-heptadien-2-one	0.6	-
1103	3-methylthiopropanoic acid	0.6	-
1105	2-phenylethanol	1.0	-
1120	ethyl 3-hydroxyisohexanoate	0.6	-
1123	ethyl 3-hydroxyhexanoate	0.2	-
1160	ethyl 5-oxohexanoate	0.5	-
1163	ethyl benzoate	1.7	2.0
1165	4-propyl-1,3-oxathiane	0.6	-
1168	p-methylacetophenone	0.2	-
1175	benzoic acid	0.9	2.2
1177	octanoic acid	0.9	-
1183	ethyl nicotinate	0.4	-
1212	β-cyclocitral	0.2	-
1215	3-phenylpropanol	8.6	9.1
1238	ethyl phenylacetate	0.1	-
1270	3,3-dimethyl-2,7-octadione	0.7	-
1283	nonanoic acid	0.3	-

1299	tridecan	0.2	-
1303	3-phenylpropyl ethanoate	0.3	1.2
1308	(E)-cinnamic alcohol	0.9	-
1315	4-vinyl-2-methoxyphenol	3.3	-
1318	ethyl 3-phenylpropanoate	2.7	1.5
1370	butyl benzoate	0.2	-
1380	(E)-methyl cinnamate	0.8	-
1383	decanoic acid	0.2	-
1395	vanilline	0.5	-
1400	tetradecan	0.4	1.2
1428	-ionone	0.3	0.2
1430	(Z)-geranylacetone	0.2	2.6
1440	ethyl-2-hydroxy-3-phenylpropanoate	0.2	
1453	(E)-geranylacetone	10.5	2.8
1470	(E)-ethyl cinnamate	18.4	7.6
1488	β-ionone	2.7	-
1500	pentadecan	0.2	-
1528	dihydroactinidiolide	2.1	1.7
1555	phenylethyl tiglate	0.6	-
1575	lauric acid	1.5	-
1580	(E,Z)-pseudoionone	1.3	-
1600	hexadecan	0.6	1.9
1800	octadecan	0.5	1.3
1828	(E,E)-farnesal	0.7	0.4
1883	(E,E)-farnesylacetone	5.0	27.8
	Total	**85**	**83.8**

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