Short paper

Triacylglycerols and fatty acids composition of egusi seed oil *(Cucumeropsis Mannii Naudin)*

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RESUMEN

Triacilgliceroles y composición de ácidos grasos del aceite de semilla de egusi (*Cucumeropsis Mannii Naudin*)

Se determinó la composición en triacilgliceroles del aceite de semilla de egusi del Camerún (*Cucumeropsis Mannii Naudin*) utilizando cromatografía líquida de alta eficacia en fase inversa. La composición en ácidos grasos de dos tipos de semillas de egusi (roja y blanca) fue obtenida por cromatografía de gases en columna capilar. El estudio de la composición en triacilgliceroles del aceite obtenido de semilla blanca de egusi reveló que sólo nueve de ellos se encontraban en proporción superior al 1% (en área). Cinco triacilgliceroles representaron más del 80% del total y el mayoritario fue el palmitoildilinoleoilglicerol (23,6%). Este aceite contiene una alta proporción de ácido linoleico (60%).

PALABRAS-CLAVE: Aceite de semilla de egusi - Acido graso (composición) - Triacilglicerol (composición).

SUMMARY

Triacylglycerols and fatty acids composition of egusi seed oil (*Cucumeropsis Mannii Naudin*)

Triacylglycerols were determined from a Cameroonian (African) white egusi seed oil (*Cucumeropsis Mannii Naudin*) using reversed phase high performance liquid chromatography. The fatty acid composition of two types of seed (red and white) is obtained by capillary gas chromatography. The study of the triacylglycerol composition obtained in white egusi seed oil revealed that only nine triacylglycerols were present in amounts above 1% (area). The first five triglycerides represent more than 80% of the total triacylglycerols, and the major triacylglycerol was palmitoyldilinoleoylglycerol, accounting for 23.6% of the oil. This oil contains a high proportion of linoleic acid (60% wt/wt).

KEY-WORDS: Egusi seed oil - Fatty acid (composition) - Triacylglycerol (composition).

1. INTRODUCTION

The egusi plant (*Cucumeropsis Mannii Naudin*) belongs to the cucurbitaceae family. This plant is grown especially for its seeds. These seeds are consumed by the populations from tropical countries (1). Concerning Cameroon, the foods from these seeds are well appreciated. Studies on cucurbitaceae seed oils have been earlier done by several investigators (2) (3) (4) (5) (6) (7). However, detailed studies on triacylglycerols and fatty acids of egusi seed oil have not been made yet.

In this paper, we report the use of reversed phase high performance liquid chromatography for the triacylglycerols separation of egusi seed oil. The fatty acids composition of two cultivars is determined by capillary gas chromatography.

2. NOMENCLATURE

The following abbreviations are used.
A: arachidic acid, eicosanoic acid, C20:0
DM: dry matter
FA: fatty acid
RP-HPLC: reversed phase high performance liquid chromatography
L: linoleic acid, cis,cis-9,12-octadecadienoic acid, C18:2
Ln: linolenic acid, all cis-9,12,15-octadecatrienoic acid, C18:3
M: myristic acid, tetradecanoic acid, C14:0
O: oleic acid, cis-9-octadecenoic acid, C18:1
P: palmitic acid, hexadecanoic acid C16:0
P': palmitoleic acid, cis-9-hexadecenoic acid, C16:1
PN: partition number
S: stearic acid, octadecanoic acid, C18:0
TG: triglyceride or triacylglycerol

3. MATERIALS AND METHODS

All the samples of extracted egusi seed oil were done in duplicate for each experiment. The samples were stored in freeze dryer before run on chromatograph.

3.1. RP-HPLC

Crude egusi oil is obtained from white seed grown in

Western Cameroon. The extraction is conducted according to IUPAC method (8). The triacylglycerols were determined by reversed phase high performance liquid chromatography. The materials and methods used have been detailed in a previous publication (9). It can be recalled that the mobile phase acetone/acetonitrile (63/37 v/v) is used. Chromatogram is obtained using the following equipment: LC-6A pump (Shimadzou, Japan); Rheodyne loop injector model 7125; refracto-detector (Chromatofield, France); a series of two LC-18 Supelcosil columns, 5 µ, 150 mm x 4,6 mm I.D. (Supelco, France). The quantitative analysis is performed by using a Spectra-Physics integrator, model SP 4290.

The triacylglycerols (TG) are separated according to their partition number (PN). This number is defined as carbons number minus two times the double bonds (10). However, this method did not allow distinguishing triacylglycerol isomers in position 1,3 or 1,2. Then, the triacylglycerols such as POS, SOP, PSO, OSP, OPS, and SPO are the same as regards the notations.

The identification of the peaks was performed using RP-HPLC chromatogram profile of wellknown oil as cottonseed and the triglycerides standard purchased from Sigma (MO, USA).

The theoretical calculations of triglycerides composition is obtained from the experimental values of fatty acids according to 1,3 random, 2-random distribution model (12).

3.2. Gas Chromatography

The oil content of two egusi cultivars seed purchased at the Dang-Ngaoundere (Cameroon) market is obtained according to AOAC method (11). The two cultivars are different by the color of their shell and seed (red or white). The fatty acid composition of these samples is obtained by capillary gas chromatography (GC). The method used has been described by Sukhija and Palmquist (13).

Fatty acid analysis was done on a Hewlett-Packard 5890A gas chromatograph fitted with automatic sampler 7673A and FID detector. Conditions: 10 % SP-2340 fused silica capillary column (0.32 mm ID; 30 m length) (Supelco, Inc., Bellefonte, PA), temperature programmed from 160°C to 180°C at 3°C/min; Initial time was 10 min and final time was 20 min; Injector and detector temperature at 220°C, air flow at 300-400 mL/min, hydrogen at 30 mL/min and nitrogen flow at 0.5 mL/min; split ratio was 100:1.

The reports generated by GC were entered into a HP microcomputer model Vectra QS/IGS. The chromatogragh was displayed on a HP video graphic color and the data were printed by a HP Deskjet 500.

Identifications were based on GC retention times of known compounds and their comparison with that of the internal standard.

The fatty acids of white egusi seed oil is also obtained by calculations from experimental triacylglycerols composition. The mathematical method have been described earlier (14).

3.3. Repeatability of the method

To determine the repeatability of the method, the same sample of crude oil was chromatographed three times for the RP-HPLC and four times for the GC, obtaining a variation coefficient for the triacylglycerol and fatty acid composition less than 6. The data presented here are the mean values.

4. RESULTS AND DISCUSSION

Figure 1 shows the chromatogram of white egusi seed oil containing 15 peaks with five important ones which represent more than 80% of the total triacylglycerols (Table I). The experimental results are compared to theoretical composition obtained from capillary fatty acids. It is observed (experiment) that palmitoyldilinoleoylglycerol (PLL) has the highest proportion.

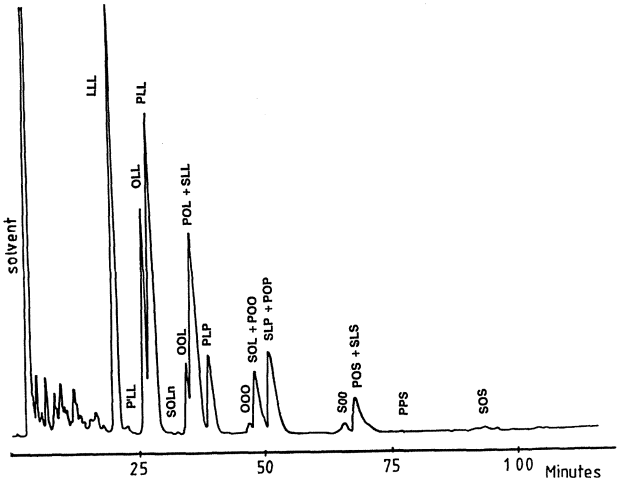

Fig. 1
RP-HPLC chromatogram of white egusi seed oil.

The fatty acid composition and oil content of two egusi cultivars seed are shown in Table II. The fatty acid composition of white egusi seed oil is compared to the theoretical value obtained from experimental triacylglycerols composition (table I).

The results suggest that the oil content as well as the total fatty acid vary according to the cultivar. The red cultivar contains slighly more oil and total fatty acid than the white one. The fatty acid profile of the two cultivars did not show any appreciable variation. However the red cultivar is richer in unsaturated fatty acids (77%) than the white cultivar (72,4%). This is the reverse tendency for saturated fatty acids with respectively 22.7 and 27.1% for red and white cultivars.

The percentages of fatty acids in white egusi seed oil is similar to those published by Badifu (1). Our analysis shows the presence of small amount of fatty acids like palmitoleic, linolenic and arachidic acids which Badifu method did not detected. The fatty acids over 20 carbons are

absent from egusi seed oil. Egusi seed oil fatty acids data can be compared to those published by Tsuyuki et al (7) on pumpkin seed oil *(Cucurbita moschata)*.

In spite of similar RP-HPLC chromatogram profile of sunflower (15) (16) (17) and egusi seed oils, triacylglycerols and fatty acids have proportions differing in each oil. The two oils are particularly rich in linoleic acid.

Table I
Triacylglycerols (TG) composition of white egusi seed oil

Triacylglycerols	Experiment (Area %)	Theoretical calculations according to 1,3- random 2-random distribution (12) (wt %)
LLL	20.4	18.9
P'LL	0.4	0.1
OLL	10	11.8
PLL	23.6	18.8
SOLn	0.1	0.05
OOL	2.6	2.5
POL + SLL	18.5	22.5
PLP	5.6	4.7
OOO	0.4	0.2
SOL + POO	5.3	6.9
SLP + PPO	7.7	8.1
SOO	0.6	0.6
POS + SLS	4	4.4
SOS	0.5	0.6

Table II
Fatty acids composition of oil from two cultivars of egusi seed

Fatty acids	Experiment (wt %)		FA calculation from TG composition according to reference 14 (Area %)
	Sample seed		
	Red	White	White seed
P	10.9	14.5	17.9
P'	0.1	0.1	0.1
S	11.5	12.6	10.3
O	14.5	12.5	10.3
L	62.3	59.6	60.1
Ln	0.1	0.2	0.2
A	0.3	0.3	
Total FA (mg/g)	872	853	
Oil content (%) in DM basis	55	47	

Contrary to the cottonseed cake which contains a toxic component called gossypol (18), egusi seed cake is a good foodstuff for the population. Egusi seed appears to be a source of linoleic acid and may constitute a useful product with good nutritional value.

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