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Contributed Paper

Determination of Some Fatty Acids in Local Plant Seeds

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ABSTRACT

Some fatty acids: palmitic acid, oleic acid, linoleic acid and linolenic acid, in plant seeds were determined. The plant seed samples were *Sesamum indicum* Linn., *Perilla frutescens*(Linn.) *Britt, Hibiscus sabdariffa* L.*, Corchorus olitorius* L., *Hibiscus canabinus, Tamarindus indica* Linn., *Irivingia ex. Malayana oliv. A.* Benn. The samples were methylated to methylester by methanolic hydrochloric and extracted by toluene. The fatty acids were analyzed by gas chromatography with DB-wax column, injector and flame ionization detector were 250°C and column temperature program. The omega-3 or a-linolenic acid was found the highest value in *Perilla frutescens*(Linn) *Britt* with the amount of 40.80 mg/g and found in *Hibiscus sabdariffa* L. *and Corchorus olitorius* L in the range of 1.82-1.90 mg/g. The Omega-6 or linoleic acid was found in all samples in the range of 0.20-16.00 mg/g. Palmitic acid and oleic acid were also found in all samples.

Keywords: omega-3, omega-6, gas chromatography, methylester.

1. INTRODUCTION

Fatty acid is a carboxylic acid with long aliphatic tail. Fatty acid is divided into saturated and unsaturated acid, depending on the presence of unsaturated double bond in the fatty acid chain [1]. Essential fatty acids are polyunsaturated fatty acid. Linoleic acid (C18:2) and α-linolenic acid (C18:3) are the parent compounds of the omega-6(ω-6) and omega-3(ω-3) fatty acid series, respectively [1]. They are essential in the human diet since they cannot be synthesized by the body. The essential fatty acids are very important to human immumne system, to help regulate blood pressure. The ω-3 and ω-6 fatty acid are found in some food; fish, shellfish flaxseed(linnseed), soya oil, canola (rapeseed) oil, hemp oil, chia seed, pumkin seed, sunflower seed, cotton seed oil, leafy vegetables and walnut.

The significance of fatty acid analysis has gained much attention because of the nutritional and health implications. The most common procedure for the analysis is the conversion of fatty acid components to methylester in order to improve their volatility. There are many papers focusing the analysis of fatty acid in plant seeds such as flaxseed (*Linum usitatissimum L.)* [2], grape seed oil [3], Thai Durian aril (*Durio zibethinus Murr.*) [4], Australian purlane (*Portulaca oleracea.*) [5], *Calodendrum capense* thumb [6], rapeseed[7], *Tamaridus* indica L [8] and China chestnut (*Sterculia monosperma, vertenat)* [9]. Therefore, the objective of this research is determination of palmitic acid, ateric acid, linoleic acid, α-linolenic acid and oleic acid in some plant seeds.

2. MATERIAL AND METHODS

2.1 Plant Seeds

Perilla frutescenes(Linn.) *Britt, Sesamum indicum* L.*, Hibicus sabdariffa* L.(Keuwyai), *Hibicus canabinus*.(977-044), *Corchorus alitorius* L.(JRC212), *Tamarindus indica* Linn. *and Irvingia ex. Malayana oliv* A. Benn. were brought from local place then dry, clean and grind.

2.2 Chemicals

Standard fatty acids (GC grade) were supplied by Fluka.

Methanolic hydrochloric was prepared by slow addition of hydrochloric acid in methanol (5:95 v/v) and stir with the constant speed.

2.3 Instrumentation

A Shimadzu gas chromatograph was performed with DB-wax fused silica capillary column (30 m x 0.25 mm i.d.., 0.25 mm film thickness). The injector and flame ionization detector were 250 °C. The column temperature program was started from 150 °C hold for 1 min, then ramp to 200 °C with the heating rate of 25 °C/min hold for 3 min and final temperature increase to 230 °C with at a rate of 15 °C/min and hold 5 min. The pressure of nitrogen carrier gas was 100 kPa.

2.4 Fatty Acid Extraction and Methylation

The procedure was similar to the previously report by Sanches-Silva et al. (2004). A 0.50 g of samples were weighted into screw-tap glass bottles then added 5 ml of toluene and 5 ml of fresh solution of methanolic hydrochloric. The bottles were closed and placed in water bath at 70 °C for 2 h. Then 5 ml of 6% potassium carbonate solution and 1 ml of toluene were added and thoroughly vortexed for 1 min. The organic phase was separated by using centrifugation at 1100 rpm for 5 min, dried organic phase with sodium sulphate anhydrous and filter by a millipore 0.45 mm. A 1 ml aliquot was injected into gas chromatograph.

2.5 Standard Calibration Curve

The standard mixture of fatty acids (2, 5, 10, 25 and 50 mg/ml) were prepared by methylation similar to the sample preparation.

3. RESULTS AND DISCUSSION

Table 1 showed analysis parameter of fatty acid by gas chromatography with DB-wax capillary column (30 m x 0.25 mm id.). The calibration ranges were 0-50 mg/ml with the correlation coefficient of 0.9918-0.9993. The detection limits were in the range of 0.08-0.54 mg/ml. Figure 1 showed chromatogram of standard fatty acids and figure 2 showed chromatogram of fatty acids extracted from *Perilla frutescenes(*Linn.*) Britt* seed. Analysis of 7 kinds of local plant seeds, the results were found palmitic acid, stearic acid, oleic

Table 1. Calibration curve of fatty acids by gas chromatograph with DB-wax capillary column (30 m x 0.25 mm i.d.).

Fatty acid	Calibration range (mg/ml)	Linear equation	R^2	% Recovery (n=3)	Detection limit(mg/ml)
Palmitic acid	0-50	Y=9.28X + 894.09	0.9992	90±5	0.05
Stearic acid	0-50	Y=10.95X + 6954.40	0.9964	93±1	0.02
Oleic acid	0-50	Y=9.19X - 1547.90	0.9993	97±5	0.03
Linoleic acid	0-50	Y=7.16X + 659.37	0.9918	89±6	0.02
α-linolenic acid	0-50	Y=9.15X - 7261.10	0.9993	90±2	0.01

Table 2. Fatty acids contents in plant seeds.

Plant seed	Fatty acid content (mg/g) ± SD (n=3)				
	Palmitic acid	**Stearic acid**	**Oleic acid**	**Linoleic acid (w-6)**	**α-linolenic acid (w-3)**
*Perilla frutescenes (*Linn.*) Britt*	4.62±0.41	0.37±0.15	7.02±0.50	13.90±1.00	40.80±2.40
Sesamum indicum L.,	2.74±0.20	0.10±0.06	10.10±0.62	16.00±1.00	nil
Hibicus sabdariffa L.,	5.84±0.08	0.60±0.01	10.55±0.04	13.53±0.08	1.90±0.05
Hibicus canabinus	0.64±0.04	0.60±0.01	9.34±0.06	12.93±0.10	nil
Corchorus alitorius L	2.94±0.11	0.93±0.01	2.11±0.07	13.53±0.20	1.82±0.01
Tamarindus indica Linn.	1.50±0.15	0.91±0.10	2.61±0.20	6.80±0.20	nil
Irvingia ex. Malayana oliv A. Benn	3.70±0.04	1.02±0.01	5.06±0.07	0.20±0.01	nil

nil =not found, less than detection limit

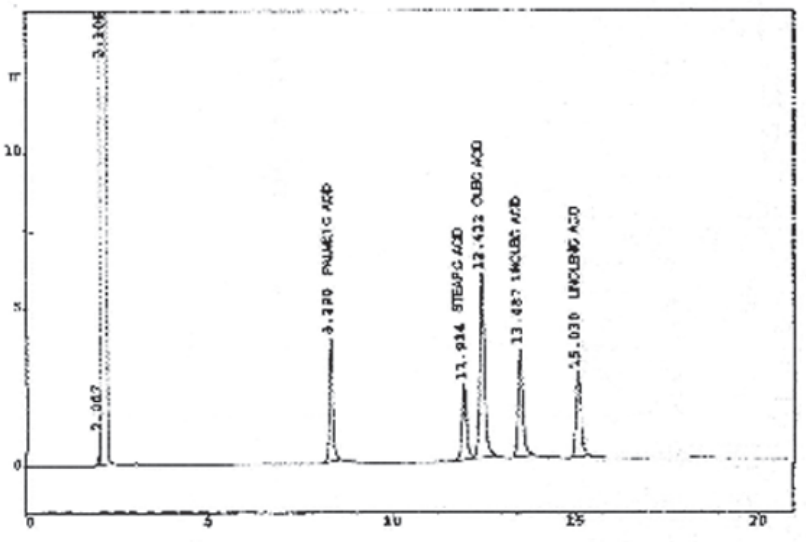

Figure 1. Chromatogram of standard fatty acid by DB-wax fused silica capillary column (30 m x 0.25 mm i.d., 0.25 μm film thickness).

acid and linoleic acid (w-6) in all plant seeds, ranging from 1.50-6.64 mg/g, 0.10-1.08 mg/g, 2.61-10.55 mg/g and 0.20-16.00 mg/g, respectively. *Perilla frutescenes (*Linn.*) Britt* seed was found a-linolenic (ω-3) in the highest amount of 40.80 mg/g. *Hibicus sabdariffa* L. and *Corchorus alitorius* L. were found ω-3 in the range of 1.82-1.90 mg/g. While *Sesamum indicum* L.*, Hibicus canabinus, Tamarindus indica* Linn. *and Irvingia ex. oliv A. Benn* were not found, as shown in table 2.

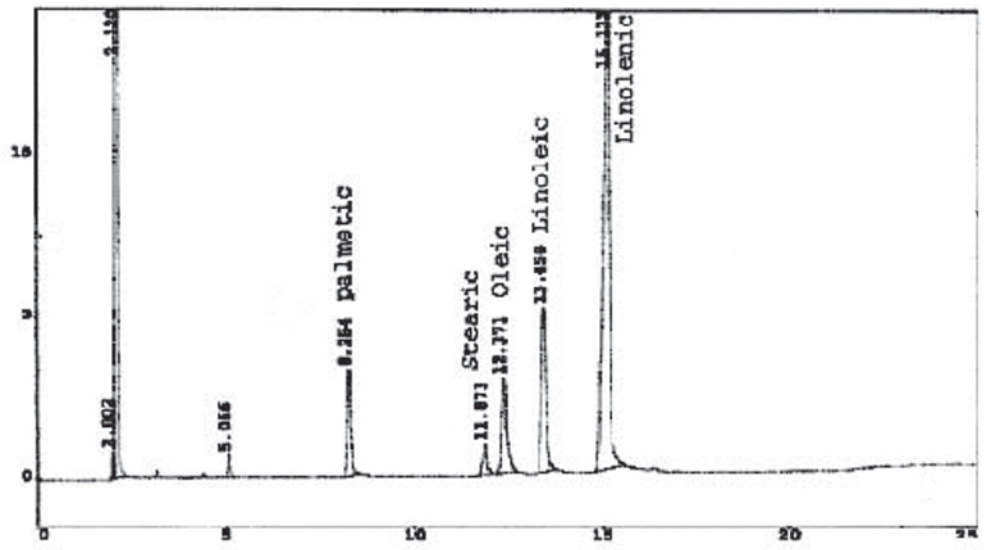

Figure 2. Chromatogram of fatty acid.

4. CONCLUSION

α-linolenic acid (ω-3) and linoleic acid(w-6) are an essential fatty acid for human. Fatty acids contents and their composition depened on the kinds of the plant seeds. *Perilla frutescenes (*Linn.*) Britt*, *Hibicus sabdariffa* L. and *Corchorus alitorius* L seed are found the potential source of w-3 and w-6.

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