FATTY ACID PROFILE OF SOME LOCAL PLANT SEEDS

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Abstract

In the present investigation the fatty acids of different plants were determined. The palmitic acid, oleic acid, linoleic acid, and linolenic acid were present in plant seeds. Hibiscus sabdariffa L., Hibiscus canabinus, and Tamarindus indica Linn were the three plant species used in the seed samples. Methanolic hydrochloric was used to methylate the materials to methylester, and toluene was used to extract them. The fatty acids were examined using gas chromatography and a DB-wax column. The injector, flame ionization detector, and column temperature program were all set at 250 °C. Hibiscus sabdariffa L. had 1.82-1.90 mg/g of a-linolenic acid, an omega-3 fatty acid. All samples had between 0.20 and 16.00 mg/g of linoleic acid, also known as omega-6. All samples included both palmitic acid and oleic acid as well.

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

Introduction

A fatty acid is an aliphatic carboxylic acid with a lengthy tail. According to the presence of an unsaturated double bond in the fatty acid chain, fatty acids are classified as saturated or unsaturated [1]. Polyunsaturated fatty acids are essential fatty acids. The parent molecules of the omega-6(-6) and omega-3(-3) fatty acid series are linoleic acid (C18:2) and -linolenic acid (C18:3), respectively [1]. Since the body cannot produce them, they are necessary in the human diet. The human immune system relies heavily on necessary fatty acids to help control blood pressure. Fish, shellfish, flaxseed (linseed), soya oil, canola (rapeseed), hemp oil, chia seed, pumpkin seed, sunflower seed, cotton seed oil, leafy greens, and walnuts are foods that contain omega-3 and omega-6 fatty acids. Due to its importance for nutrition and health, fatty acid analysis has received a lot of attention. The most typical method for the analysis is the methylesterification of fatty acid components to increase their volatility. Numerous papers have examined the fatty acids found in plant seeds like flaxseed (Linum usitatissimum L.), grape seed oil, Thai durian aril (Durio zibetbinus Murr.), and others. Portulaca oleracea, an Australian purlin [5], Calodendrum capense thumb [6], rapeseed [7], Tamaridus indica L [8], and Sterculia monosperma, vertenat, an Asian chestnut [9] are further examples. Therefore, the goal of this study is to identify the presence of oleic, palmitic, ateric, linoleic, and -linolenic acids in different plant seeds.

2. Material and Methods

2.1. Plant Material

The following plants were brought from a nearby location: Hibicus sabdariffa L. (Keuwyai), Hibicus cannabinum, and Tamarindus indica Linn. They were then dried, cleaned, and ground.

2.2. Chemicals

Fluka provided standard (GC grade) fatty acids. Hydrochloric acid was slowly added to methanol (5:95 v/v) and stirred at a steady pace to create methanolic hydrochloric.

2.3. Instrument

With a DB-wax fused silica capillary column (30 m x 0.25 mm i.d., 0.25 mm film thickness), a Shimadzu gas chromatograph was employed. Both the flame ionisation detector and the injector were 250 o C. The column temperature programme began at 150 o C, held for 1 minute, ramped to 200 o C with a heating rate of 25 o C/min, held for 3 minutes, and reached 230 o C with a rate of 15 o C/min, held for 5 minutes. The nitrogen carrier gas had a pressure of 100 kPa.

2.4. Fatty acid examination

The process followed that described in the Sanches-Silva et al. (2004) study. 0.50 g of samples were weighed into glass screw-tap bottles, and 5 ml of toluene and 5 ml of freshly made methanolic hydrochloric solution were then added. The bottles were sealed and submerged in a water bath set at 70 o C for two hours. The mixture was thoroughly vortexed for 1 minute after 5 ml of a 6% potassium carbonate solution and 1 ml of toluene were added. Centrifugation at 1100 rpm for 5 minutes, drying of the organic phase with sodium sulphate anhydrous, and filtering through a millipore 0.45 mm were used to isolate the organic phase. Gas chromatograph was filled with a 1 ml aliquot.

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. Result and Discussion

The fatty acid measurement parameters by gas chromatography using a DBwax capillary column (30 m x 0.25 mm id.) were shown in Table 1. With a correlation coefficient of 0.9918–0.9993, the calibration ranges were 0–50 mg/ml.

The detection thresholds fell between 0.08 and 0.54 mg/ml. Following the analysis of three different types of local plant seeds, it was shown that all plant seeds contained palmitic acid, stearic acid, oleic acid, and linoleic acid (w-6), with concentrations ranging from 1.50 to 6.64 mg/g, 0.10 to 1.08 mg/g, 2.61 to 10.55 mg/g, and 0.20 to 16.00 mg/g, respectively. The presence of Hibicus sabdariffa L. was detected in the range of 1.82-1.90 mg/g. As stated in table 2, Hibicus canabinus and Tamarindus indica were not discovered.

Conclusion

Essential fatty acids for humans include linoleic acid (w6) and -linolenic acid (-3). The amount and makeup of fatty acids depend on the type of plant seeds. The seeds of Hibicus sabdariffa L. are a potential source of w-3 and w-6.

Table 1. Calibration curve of fatty acids by gas chromatograph with DB-wax capillarycolumn (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)
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
Tamarindus indica Linn.	1.50±0.15	0.91±0.10	2.61±0.20	6.80±0.20	nil

nil =not found, less than detection limit

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