

Study of Some Biochemical Parameters and Fatty Acids Composition in Blood Serum of Women with Polycystic Ovary Syndrome

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Abstract: This study was designed to compare the level of some biochemical parameters and lipid fractions and percentage of fatty acids in serum of women with Polycystic ovary syndrome (PCOS), the study include (25) patients (females) who were diagnosed by ultrasonography, the sample collection is from Al-Bitol teaching hospital in Mosul city, the age is between (25-40) year and compared with (25) normal woman with same age were collected as control and measurement of a number of biochemical parameters in serum, as well as analysis and measurement of percentage of fatty acids in the fatty component of serum (cholesterol ester, phospholipids and triglyceride) by applying thin layer chromatography (TLC) and then re-esterification fatty acids and measurement percentage of fatty acids applying capillary gas chromatography (CGC). The result of this study show that there is a significant differences in the level of studied biochemical parameter and fatty acids percentage in patients compared with the control group.

Keyword: Biochemical parameters, Blood serum

Introduction

The polycystic ovary syndrome (PCOS) is considered as a common disease as it affect is about 30% of female all over the world (1). In which there is irregularity in menstrual cycle and it is lead to delay in pregnancy but it not cause infertility (2). The polycystic ovary syndrome is characterized by presence of small size follicles inside the ovary and specially under the external wall of ovary (3). The polycystic ovary syndrome is due to hormonal disturbance such as (LH, Estrogen and Dopamine) hormones (4) which lead to menstruation disturb and ovulation disturbance is usually accompany by hypertension, weight gain and hirsute in some areas of body specially the chin and chest (5). The polycystic ovary syndrome is probably a mixed group of related conditions, in it is full from there is hirsutism, amenorrhoea, infertility and ovarian abnormalities in the form of follicular cysts and a thickened capsule preventing ovulation (6). The condition may be discovered during investigations for infertility, breast development is usually normal but endometrial proliferation varies from the unstimulated state to hyperplasia (7).

Materials and Method

Samples Collection

In this study the blood samples were collected from patients after fasting period for (10-12) hours and (5) ml of blood from each subject was collected and serum was separated from it and then divided into two parts: 1st part

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measurement of the following parameters glucose, total cholesterol(TC), high density lipoprotein cholesterol(HDL-C),triglyceride (TG),low density lipoprotein cholesterol (LDL-C) by enzymatic methods using kits(8,9), very low lipoprotein cholesterol(VLDL-C) was measurement theoretical(10) ,and phospholipids(PL) by colorimetric method (11).the 2nd part was stored at (-18)°c until measurement of fatty acids.

Extraction and Separation of lipids from Serum

Serum samples were treated with methanol and chloroform to extract lipids(10), lipids extract was separated into three parts cholesterol ester (CE),triglyceride(TG),phospholipids(PL)using thin layer chromatography (TLC).(11)

Transmethylation of Fatty Acids

In this study analysis and esterification of fatty acids by using tri-floro boron (BF₃) in Methanol(16%)(12).

Measurmeant of Percentage of Fatty Acids

Measurement of fatty acids in the three lipid fractions was performed by Capillary Gas Chromatography (CGC) Shimadzo 2010,column type TR-WAX, and length 30m, in industry center (Syria).

Statistical Analysis

Results were analyzed statistically for biochemical parameters and the percentage of fatty acids using *t*-test, $P < 0.05$ was considered statistically significant (13).

Results and Dissociation

Serum Glucose

The results showed that a significant increase in serum glucose in woman with Polycystic Ovary Syndrome(PCOS) compared with that control group as indicated in table (1) this increase may be due to insulin resistance which leads to increase serum glucose (14) or due to insulin metabolism defect (15) .This result is agreement with other studies(16,17).

Lipid Fractions

The results showed that a significant increase in total cholesterol (TC) in woman with (PCOS) compared with that of control group as indicated in table (1) this increase may be due to increase in (TC) synthesis as a result of insulin resistance in woman with (PCOS) (18).and the results showed that a significant decrease in (HDL-C) in patients comparison with control group as show in table (1) the cause of that may be due to close relationship to the elevated activity of plasma CETP(cholesterol ester transfer protein) which promotes the lipoprotein cholesterol of HDL to be transfered to other lipoprotein in patients (19).on the other hand, the results showed that there is significant increase in (LDL-C) may be due to defect in hepatic receptor (Apo B100) which plays an important role in increasing (LDL-C) through decreasing transport of (LDL-C) to hepatic tissue(20). But the results of (TG) and (VLDL-C) in patients showed insignificant results compared with control group as show in table (1),the same results were obtained in other new studies(21,22,23). whereas the results showed that a significant increase in (PL) this increases may be due to action of hepatic lipases which lead to abnormality metabolism of lipids specially phospholipids (24) and may cause of smoking which is play import role of increase (PL) in serum (25).

Table 1. Serum biochemical parameters from PCOS and control group

Biochemical Parameters	PCOS	Control	P value
mmol/l	25	25	
Glucose	6.86±1.65	4.35±0.23	<0.001
TC	6.83±1.30	4.67± 0.83	<0.001
HDL-C	0.87±0.20	1.41±0.21	<0.001
LDL-C	6.12 ±0.51	4.76±0.11	<0.001
TG	2.32±0.47	1.92±0.86	0.1
VLDL-C	1.04 ±0.08	0.86±0.03	0.12
PL	179± 11.54	165±9.87	<0.05

Values :Mean ± SD

Percentage of fatty acids:

The percentage of fatty acids was measured by using (CGC) through comparison of results with standard sample composed of (12) fatty acids, as indicated in fig(1): from the result analysis of standard sample of fatty acids and table (2)demonstrated a retention time (Rt) of these standard fatty acids.

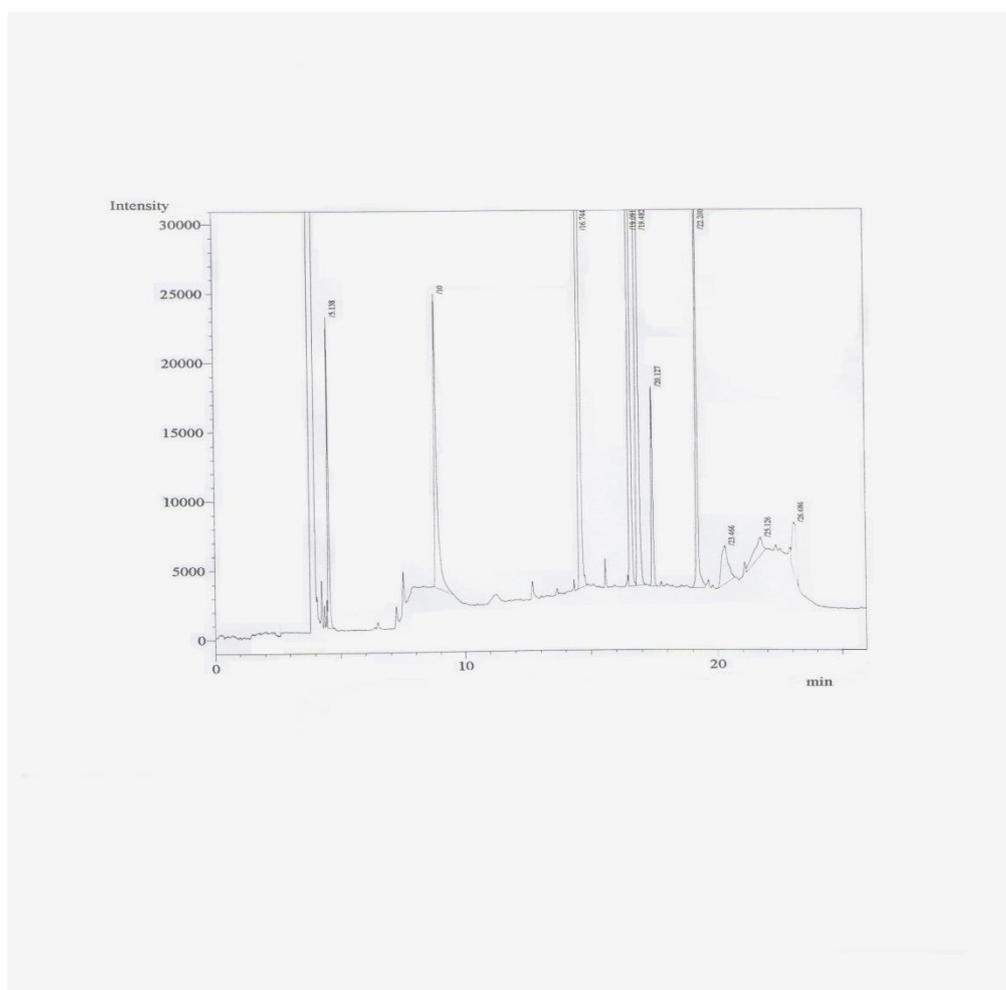


Figure 1. The CGC chart of (12) standard fatty acids

Table 2. Standard fatty acids

Standard fatty acids	Symbol	Retention time(min)
Capric acid	C10:0	4.900
Lauric acid	C12:0	5.138
Myristic acid	C14:0	8.500
Palmitic acid	C16:0	10.08
Palmitoleic acid	C16:1	16.74
Stearic acid	C18:0	19.09
Oleic acid	C18:1	19.48
Linoleic acid	C18:2	20.12
Linolenic acid	C18:3	22.20
Arachidonic acid	C20:4	23.46
Eicosapentaenoic acid	C20:5	25.12
Docosahexaenoic acid	C22:6	26.68

Percentage of fatty acids in (CE) part : Fig (2)

The results showed that a significant increases in percentage of total saturated fatty acids (SFA) in woman with (PCOS) in comparison with control group ,as show in table (3), this increasing may be due to abnormality in metabolism of fatty acids in patients (26).also a significant decrease in percentage of total monounsaturated fatty acids (MUFA) and a significant increase in percentage of total polyunsaturated fatty acids (PUFA) in this parts , this increasing may be due to insulin resistance in (PCOS) patients which leads to a big defect in enzymes action which leading to defect in percentage of unsaturated fatty acids (27).

Percentage of fatty acids in (TG) part: Fig (3)

The results showed that a significant increase in percentage of total (SFA) and total (MUFA) ,on the other hand a significant decrease in percentage of total (PUFA) in PCOS patients in compared with that of control group ,as shown in table (3), this may be due to some type of food(butter fat and hydrogenate vegetable oils) which leads to increase the risk factor of PCOS disease such as trans-fatty acid (28),or may be due to transport (Acetyl-CoA) from different metabolism pathway to pathway causes anabolism of fatty acids (29).

Percentage of fatty acids in (PL) part : Fig (4)

The results showed that a significant decrease in percentage of total (SFA) ,on the other hand a significant increase in percentage of total (MUFA) and (PUFA) in PCOS patients in comparison with control group ,as show in table (3),this decreasing or increasing may be due to defect in action of desaturation enzyme (Δ 9) desaturase and elongation enzymes (Δ 6),(Δ 5) in PCOS patients (30).

Table 3. Percentage of fatty acids composition of CE,PL,TG in serum PCOS woman and control group

Fatty acid	CE		PL		TG	
	control n 10	PCOS 5	control 10	PCOS 5	control 10	PCOS 5
SFA						
10:0	1.0±0.13	0.70±0.05	0.09±0.01	0.69±0.08	0.10±0.04	0.3±0.10
12:0	1.3±0.23	1.62±0.22	1.5±0.31	1.75±0.09	2.00±0.30	6.0±0.15*
14:0	0.56±0.10	1.36±0.30	0.38±0.1	2.95±0.18*	4.0±0.65	5.24±0.38
16:0	6.00±1.52	3.80±1.21*	10.25±2.8	2.43±0.89*	25.0±2.60	24.0±3.34
18:0	3.00±0.47	10.52±2.21*	10.01±1.3	11.75±1.87	5.25±1.24	7.25±0.9*
Total	11.86±2.45	18.00±3.99*	22.23±4.5	19.57±3.11*	36.35±4.83	42.8±4.9*
MUFA						
16:1	1.70±1.20	2.23±0.87	2.30±0.7	5.6±0.87*	3.50±0.35	7.28±1.2*

18:1	18.0±2.54	15.0±2.65*	8.30±1.44	9.26±2.11	20.24±1.24	18.9±1.8*
Total	19.70±3.74	17.23±3.52*	10.6±2.14	14.86±2.98*	23.74±1.59	26.18±3.*
PUFA						
18:2 n-6	20.0±2.43	22.0±3.32*	18.78±3.2	17.65±1.65	18.26±2.77	17.12±1.9
18:3 n-3	2.30±0.44	4.50±0.76*	2.10±0.98	5.74±2.43*	2.85±0.67	1.80±.55
20:4 n-6	6.80±1.77	10.23±1.83*	10.24±3.2	14.28±2.29*	4.85±0.55	3.24±.76
20:5 n-3	1.56±0.5	4.00±0.88*	2.85±0.34	5.56±1.20*	2.90±0.54	2.68±.21
22:6 n-3	2.38±0.91	5.00±0.67*	2.3±0.50	4.5±1.54*	6.65±0.88	2.56±1.3*
Total	33.04±6.0	45.73±7.46*	36.27±8.2	47.73±9.11*	35.51±5.41	27.4±4.7*
n-3	6.24±1.85	13.50±2.31*	7.25±1.82	15.8±5.17*	10.40±2.09	10.04±2.1
n-6	26.8±4.20	32.23±5.15*	29.0±6.40	31.93±3.94*	20.11±3.32	25.36±2.*

Values :Mean ± SD * : P value < 0.05

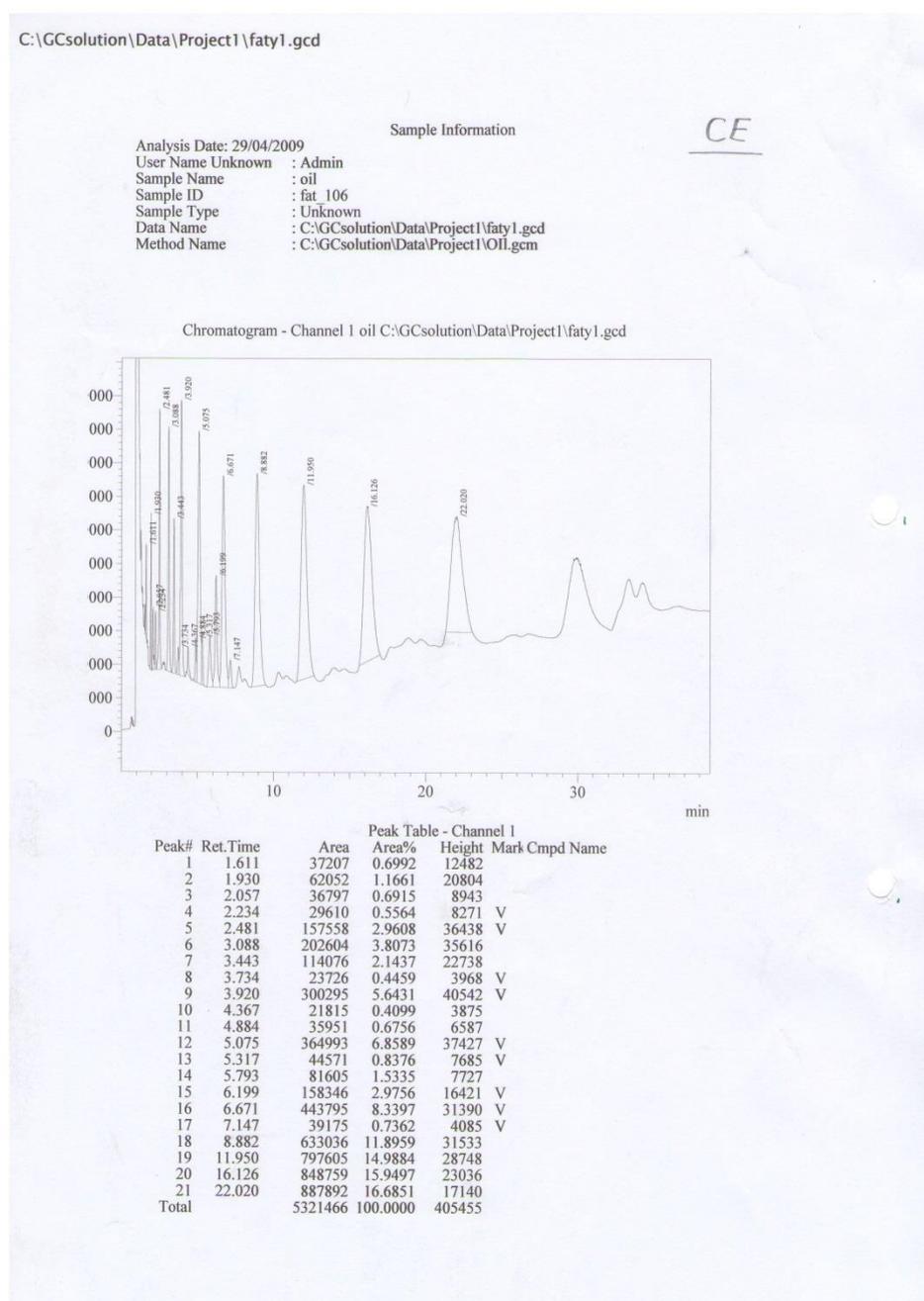


Figure 2. The CGC chart of fatty acids in CE part

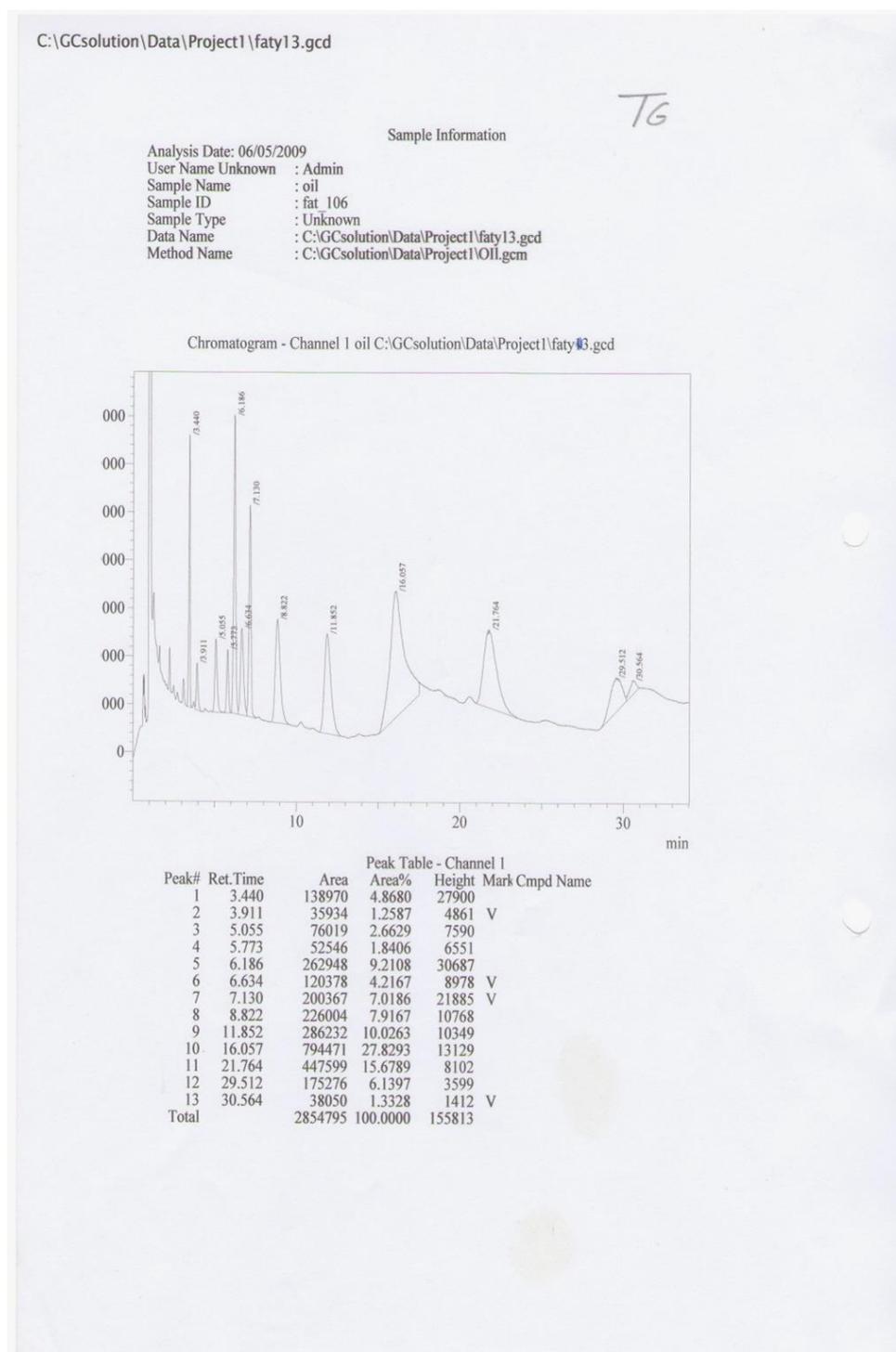


Figure 3. The CGC chart of fatty acids in TG part

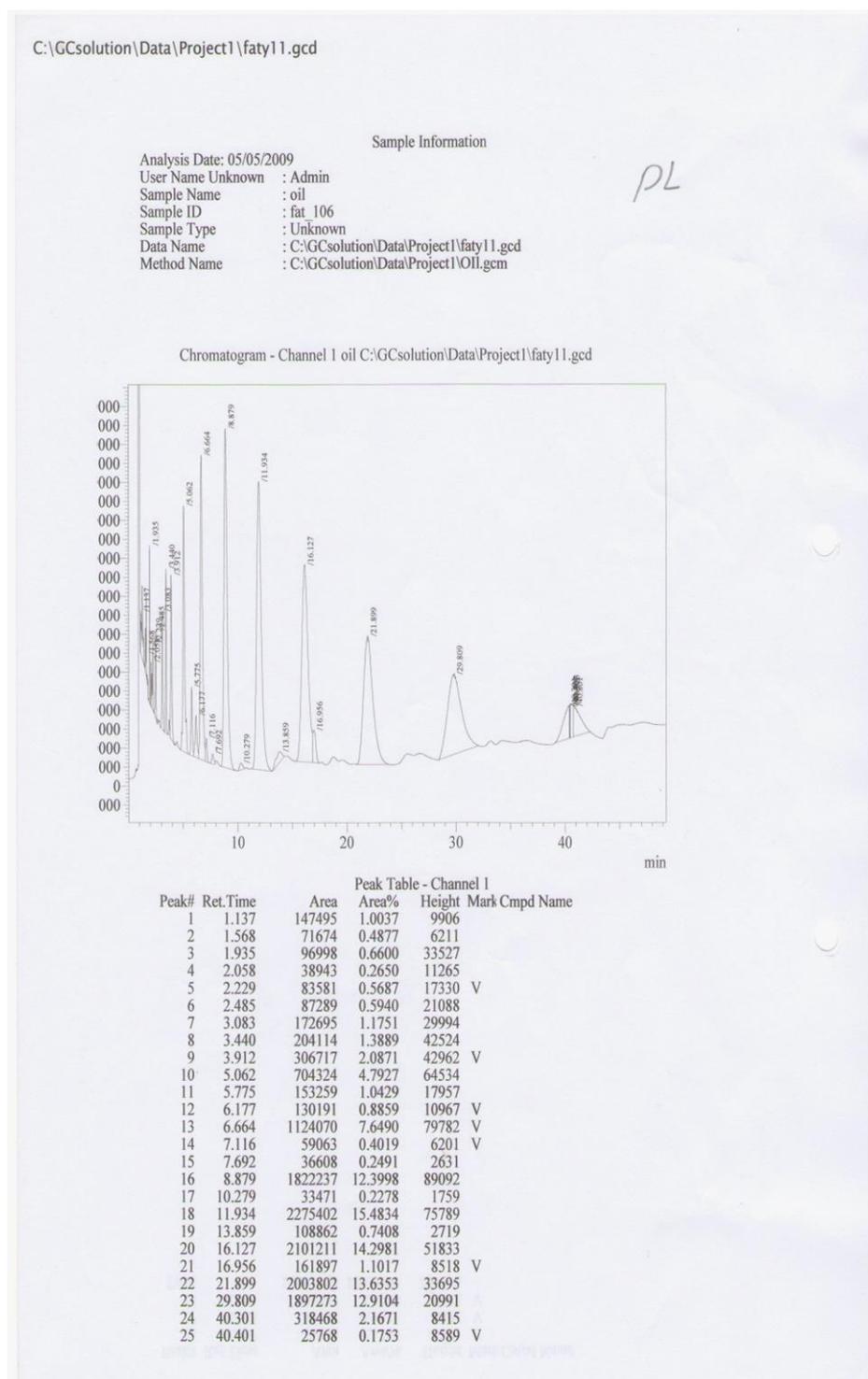


Figure 4. The CGC chart of fatty acids in PL part

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