

Corylus avellana L.

*

***E-mail: rehabsra@Yahoo.com**

(2014/ 5/ 26 2014/ 2 /16)

Oleic acid, Linoleic acid, Palmitic, Lauric acid and)

1.5)	MS	<i>Corylus avellana</i> L.	(Stearic acid
			/ (1.0
		MS	2,4-D BA Phe.
		80 40	

Gas Chromatography (GC)

Linoleic acid Oleic acid

Phe.

Investigate about some of Fatty Acids in Callus Cultures of *Corylus avellana* L. Induce by Phenylalanine (Phe.)

Rehab A. Al-Bker Hana S. Al Salih

Department of Biology/College of Sciences/ University of Mosul

Faris T. Al Abachi

College of Pharmacy/ University of Mosul

ABSTRACT

Oleic, linoleic, palmitic, lauric and stearic acids were isolated and identified in the callus culture of hazelnut *Corylus avellana* L., which were induced and grown on MS media supplemented with 1.5 and 1.0 mg/l of BA and 2,4-D respectively, as well as the callus cultures that grown on the same medium in addition to different concentration of Phenylalanine (Phe.), Callus grown on MS medium without addition of growth regulators (MSO) was used as control. Fresh weights of callus were recorded after 40 and 80 days of culture.

Gas chromatography was used for identification of the fatty acid, and found that both oleic acid and linoleic acid were the most common in the callus cultures of hazelnut, also found that fatty acids identified in callus culture of hazelnut vary in their types as well as their quantity according to the concentration of Phenylalanine added with plant growth regulator to the medium, and that concentration of fatty acids in callus cultures increased with the increase of callus age.

Keywords: *Corylus avellana*, Callus, fatty acids, Phenylalanine.

Corylus avellana L.

.(APG system III, 2009) Corylaceae

Betulaceae

Corylus (Hazelnut)

765 2009
10 42 104

500

.(FAOSTAT, 2011)

%7 %12 %19

(Stahl, 2007; Arab Encyclopedia, 2005)

Soybean

(Li and Parry, 2011) %60

Linoleic acid

%70

Quarta *et al.*, 2007;)

Linoleic acid

Oleic acid

.(Amaral *et al.*, 2006

(Li and Parry, 2011)

100/ 80-75

Omega-3

.(Iso *et al.*, 2002; Aronson *et al.*, 2001; Connor, 2000)

Linoleic acid

Oleic acid

()

BA / (1.0 1.5)

(Murashige and Skoog, 1962)

MS

()

2,4-D

1.5

(2011

) *Corylus avellana*

MS

MSO

/

(1.0 0.8 0.6)

Phe.

(1±25°)

.(Hepaire)

(8)

(16)

80 40

18 *Corylus avellana*

/

.....

1963 (Dalgarno and Birt)

.(Mohammad, 1971) Gas Chromatography(GC)

MS
 20 (80 40) Phe.
 ° 25 (4) (:) (1 : 2) :
 10 5 Whatman No.1
 (:) (2:1) :
 ° (55-50)
 50 ()
 5 ()
 (:) (1 : 2) : 100
 (Ultra Turrax blender, Germany)
 30 / 22 Ultrasonic
 ° 25 (4)
 (Methanolic-HCl) 1.5 50
 3 ° 100 Reflex Condenser
 30
 () -

Gas Chromatograph (GC)

(GC)

(Packard Model 438A)

Hewlett Packard

3 1/8 SE-30 /

° 325

Film Ionization Detector (FID)

He

/ 10 ° 300-120

/ 30

/ 30

Carrier Gas

.(Shaw, 1974; Smith *et al.*, 1969)

Corylus avellana

Phe.

: 40

-1

(1.0 1.5)

MS

(1)

2,4-D

BA

/

3.71

(2011

)

.%147.3

(Schmülling, 2004; Mok *et al.*, 2000)

.(A-1)

Phe.

MS

% (98-60)

.(1)

Phe.

Phe.

.(Bauer *et al.*, 2011)

MSO

40

%33.3

2.0

.(Pierik, 1997)

: 1

40

Corylu savellana

%	/	/	(/)	
			Phe.	(1.5) BA+(1.0)2,4-D
98.0	1.47	2.97	0.6	
88.0	1.32	2.82	0.8	
60.0	0.9	2.41	1.0	
147.3	2.21	3.71	MS	
33.3	0.5	2.0	MSO	

:

.....

80

-2

80 (2)

2,4-D BA / (1.0 1.5) MS
 %253.3 5.3

2,4- BA 40

2,4-D BA Qaderi D
 (Qaderi *et al.*, 2012)

Populus nigra L. BA (2013)

Corylu savellana

.(B-1)

Phe. MS

(1.0 1.5) MS

Phe. / 0.6 2,4-D BA /
 .% 213.3 4.7

.(C,D,E -1)

MSO

80 % 53.33 2.3
 40

2,4-D BA
 2,4-D / 0.5 BA / 1.5 (2013)

Prosopis farcta

: 2

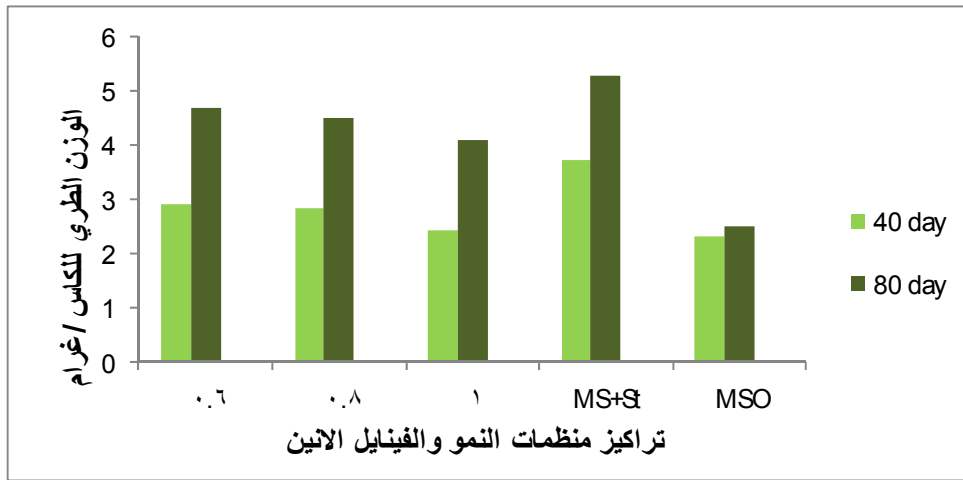
80 *Corylu savellana*

%	/	/	(/)	
			Phe.	(1.5) BA+(1.0) 2,4-D
213.3	3.2	4.7	0.6	
200	3.0	4.5	0.8	
173	2.6	4.1	1.0	
253.3	3.8	5.3	MS	
53.33	0.8	2.3	MSO	

:

MS 80 40
 / (1.0 1.5) 2,4-D BA / (1.0 1.5)

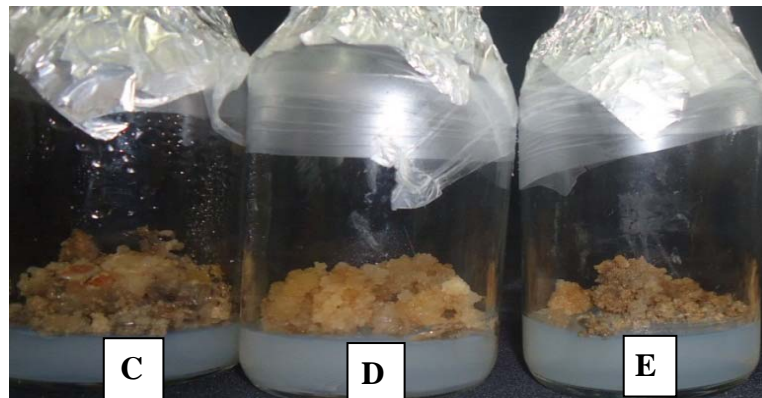
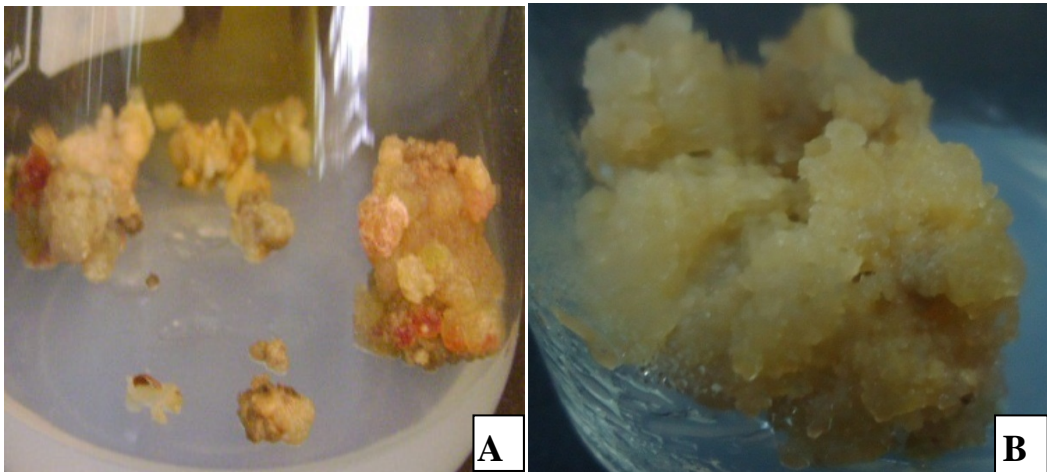
Phe. / 0.6 2,4-D BA
 MSO
 (1)



MS :1

(80 40)

Phe.



MS :1
 MS:B (40) / 1.0 BA / 1.5 MS
 MS :D (80) / (0.6) Phe.+ MS :C (80)
 (80) / (1.0) Phe.+ MS :E (80) / (0.8) Phe.+
 Corylus avellana L.
 2,4-D
 80 40

.....

:

GC

(2) (Oleic, Linoleic, Palmitic, Stearic, Lauric acid) :

.(3)

(1.5 1.0)

MS

Oleic

40

BA

2,4-D

/

.(A-2)

Oleic

(A-3)

15.21

80

Oleic

Palmitic

14.67 13.48

40

) 2.77

Oleic

.(A-4)

Linoleic

. 80 (

) 3.88

40 (

/ 0.6

MS

40 Phe.

80

.(B-3)

Oleic acid Linoleic acid

Oleic

Palmitic

15.55 14.01

.(B-4)

acid

Palmitic acid

Oleic acid

.(3)

80

0.192

Palmitic acid

0.495

/ 0.8 Phe.

40

80

(3) 0.06

.(C-3)

Oleic acid

.(C-4)

Palmitic Linoleic Oleic acid

40

Phe.

/ 1.0

MS

14.7

Linoleic acid

80

.(3)

Linoleic

Oleic

(D-3)

.(D-4)

Palmitic acid Linoleic acid Oleic acid

80

0.793

40

0.046

Oleic acid

.(3)

Stearic acid

40

MSO

(E-3)

(E-4)

80

(3)

Linoleic acid

Linoleic acid Oleic acid

.(F -3)

(3)

(0.024 0.027 0.013)

Palmitic acid

(Ozdemir, 2001)

Phe.

(George *et al.*, 2008)

(2010)

Sesamum indicum L.

(2013) Linoleic acid Oleic acid

Linoleic acid Oleic acid

.Stearic acid Lauric Palmitic

Oleic acid

(Li and Parry, 2011 ; Quarta *et al.*, 2007)

MS

Corylus avellana

:3

Gas

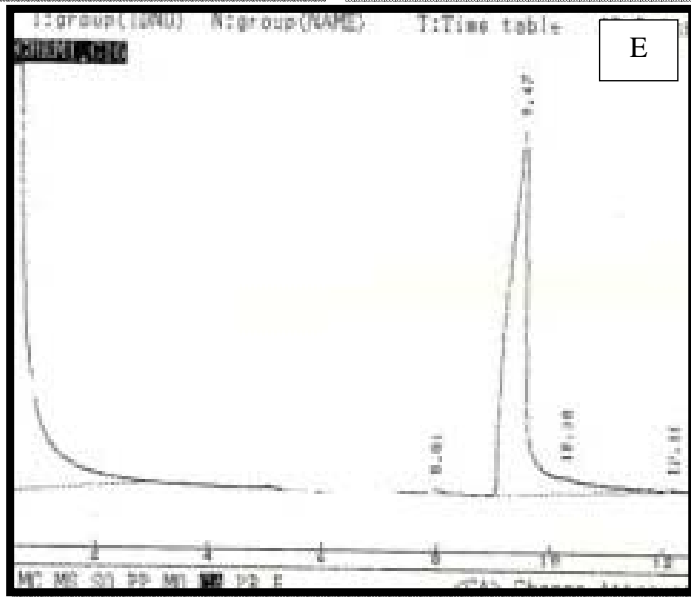
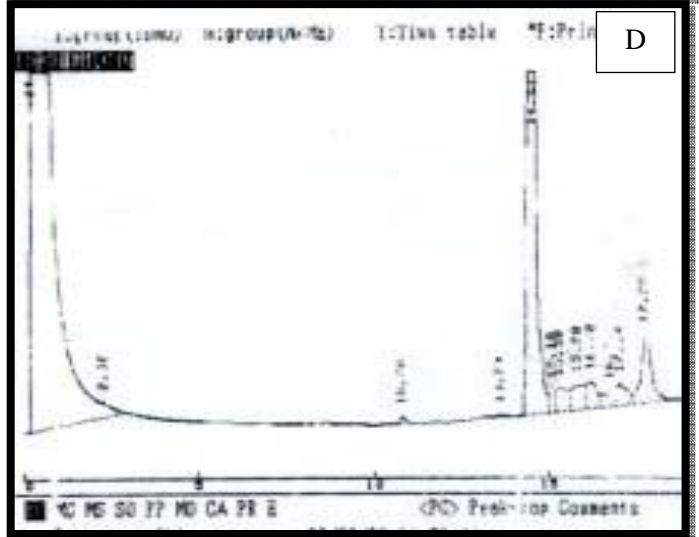
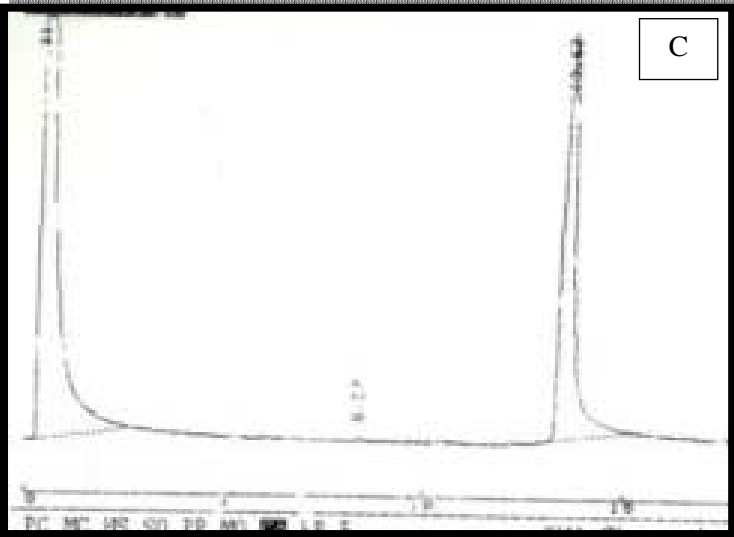
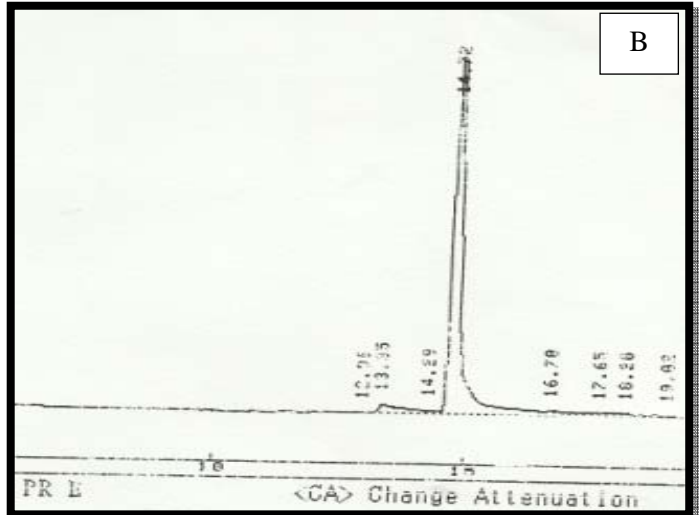
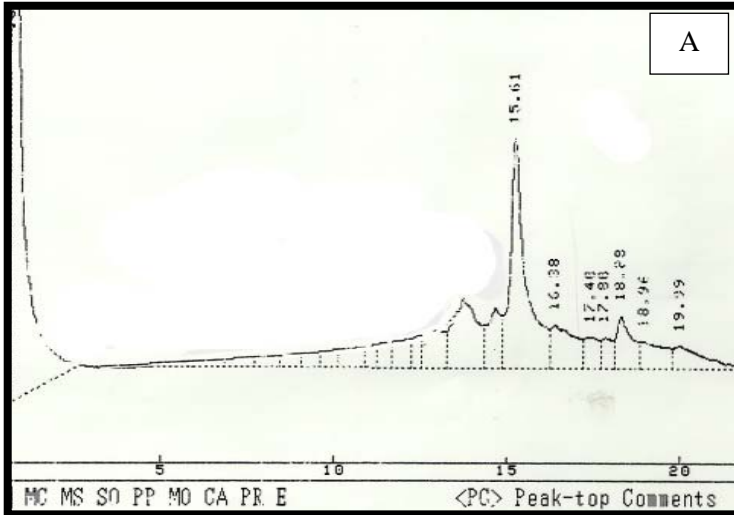
Phe.

(2,4-D / 1.0 BA / 1.5)

Chromatography

) / Concentration		/	/		()
80	40				
3.88	2.77	15.21	15.61	Oleic acid	/ (1.5) BA+(1.0) 2,4-D +MS
0.99	0.62	14.67	14.72	Linoleic acid	
1.29	1.31	13.71	13.63	Palmitic	
0.495	0.06	15.55	15.61	Oleic acid	
0.061	0.016	14.85	14.72	Linoleic acid	
0.192	0.037	14.01	13.63	Palmitic	
0.017	0.015	9.36	9.47	Lauric	
0.125	0.060	15.52	15.61	Oleic acid	
0.158	0.016	14.60	14.72	Linoleic acid	
0.031	0.037	13.99	13.63	Palmitic	
0.793	0.046	15.33	15.61	Oleic acid	
0.019	0.131	14.70	14.72	Linoleic acid	
----	0.026	13.93	14.55	Stearic acid	
0.059	0.040	13.17	13.63	Palmitic	
0.010	0.006	15.07	1615.	Oleic acid	
0.0006	0.0013	14.87	14.72	Linoleic acid	
0.007	0.005	13.7	13.63	Palmitic	
0.013		15.03	1615.	Oleic acid	
0.027		14.69	14.72	Linoleic acid	
0.024		13.86	13.63	Palmitic	

.....



Gas Chromatography

()

:2

Palmitic

- C/ Linoleic acid

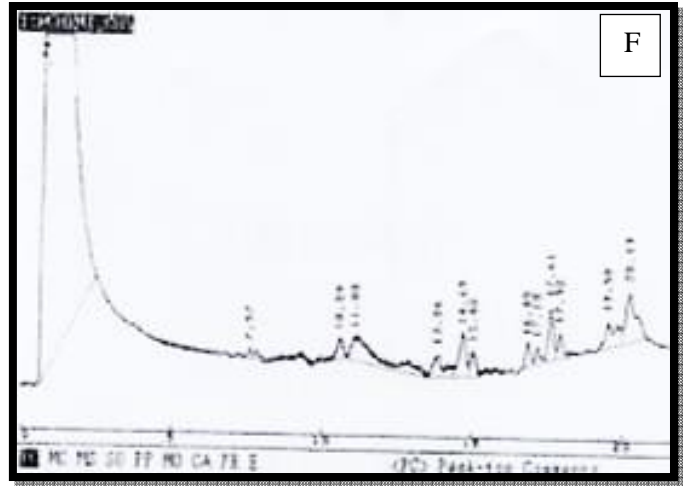
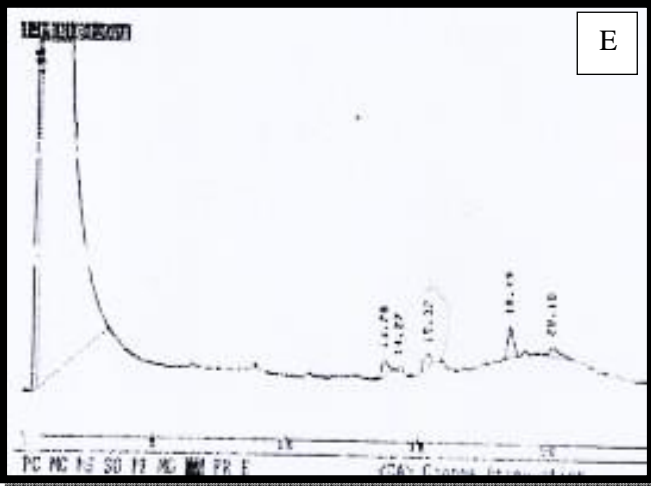
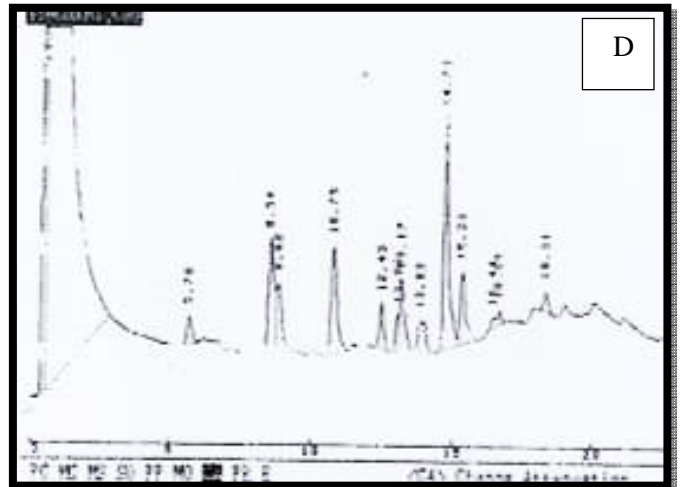
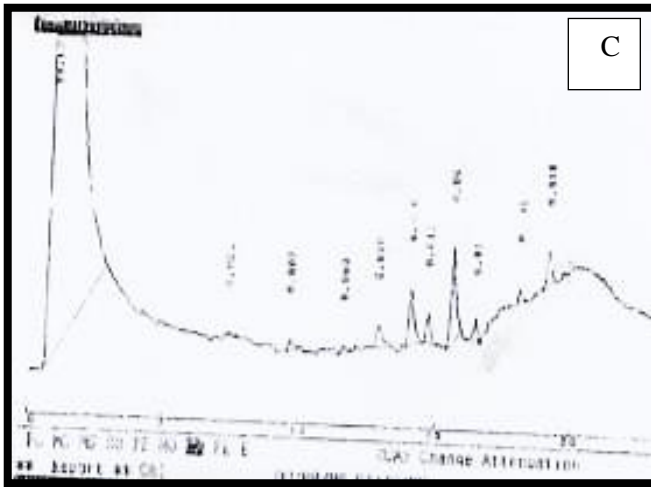
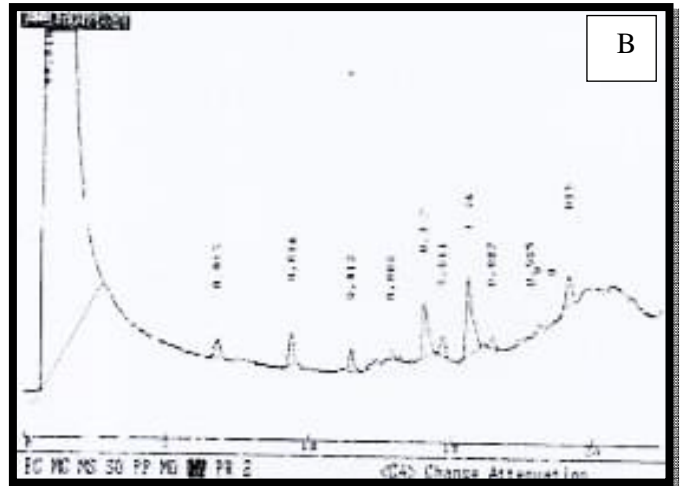
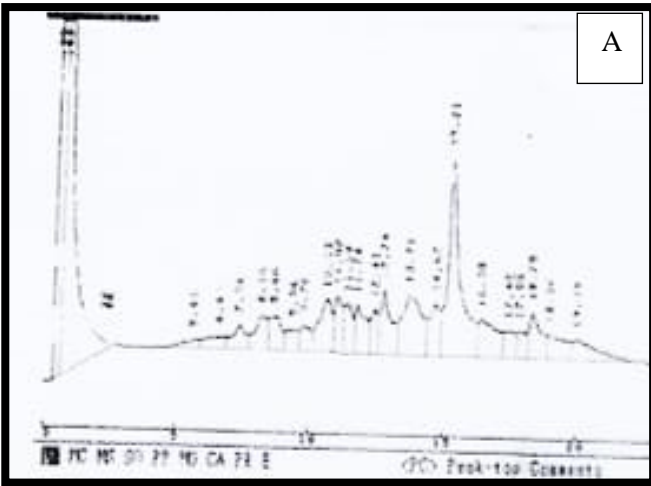
-B / Oleic acid

-A

.Lauric acid

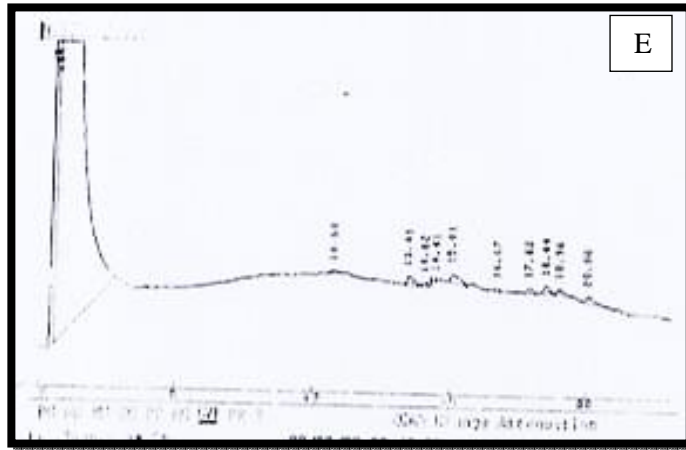
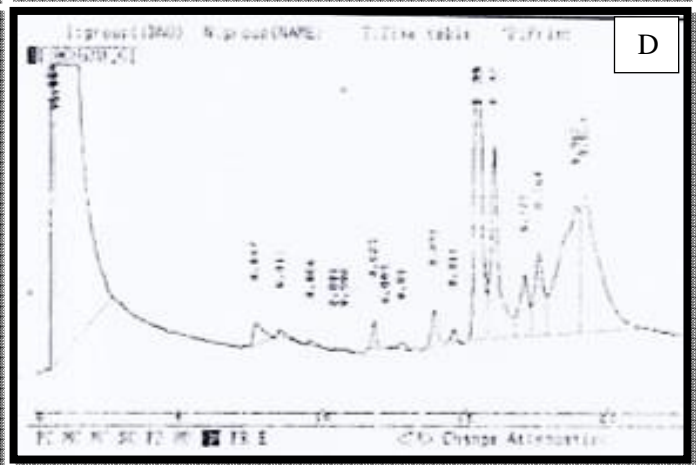
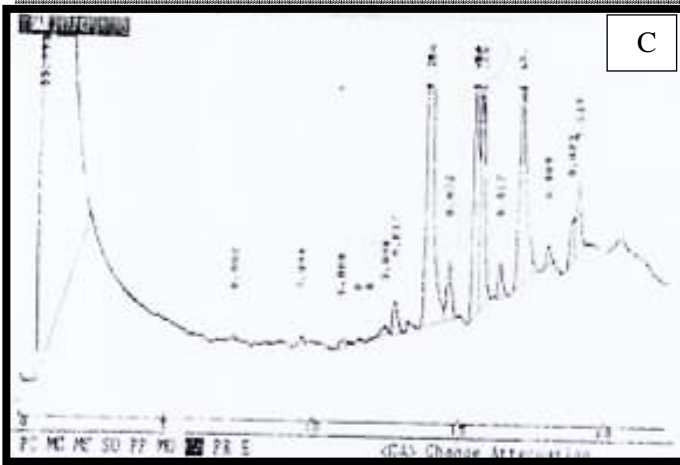
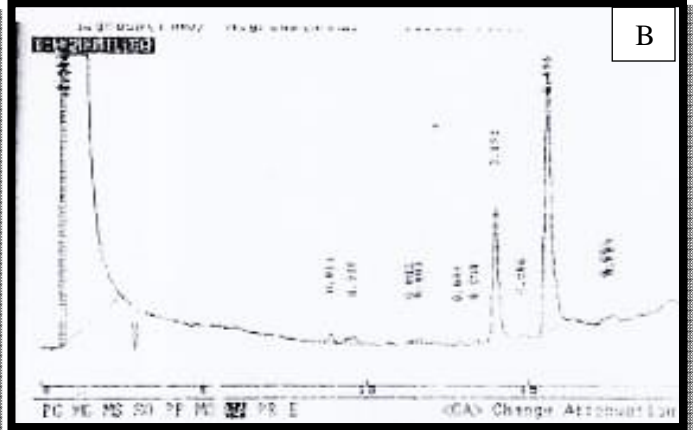
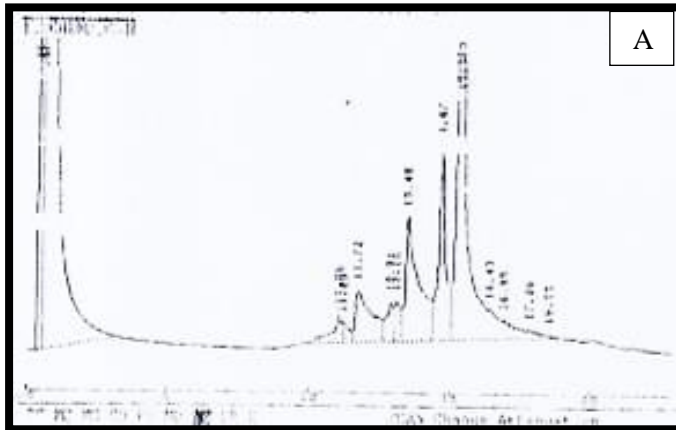
- E / Stearic acid

-D acid



2,4-D / 1.0	BA / 1.5	()	()	:3
		MS		<i>Corylus avellana</i>
.Gas Chromatography				
.Phe. / (0.6) +		MS -B		MS -A
.Phe. / (1.0) +		MS -D	.Phe. / (0.8) +	MS -C
		- F		MSO-E

.....



2,4-D / 1.0 BA / 1.5 MS *Corylus avellana* :4
 . Gas Chromatography 80 Phe.
 .Phe. / (0.6) + MS -B . MS -A
 .Phe. / (1.0) + MS -D .Phe. / (0.8) + MS MS -C
 .MSO -E

	<i>Prosopis farcta</i>		(2013)		
		111-95 (24)	6		
		(2011)			
				<i>Corylus avellana</i> L.	
				(126-117)	4 6
<i>Populus</i>		(2013)			
		17-1 (24)	6		<i>nigra</i> L.
				(2010)	
				<i>Nigella sativa</i> L.	
	<i>Sesamum indicum</i> L.		(2013)		

- Amaral, J.S.; Casal, S.; Citova, I.; Santos, A.; Seabra, R.M.; Oliveira, B.P.P. (2006). Characterization of several hazelnut (*Corylus avellana* L.) cultivars based in chemical, fatty acid and sterol composition. *Eur. Food Res. Technol.* **222**, 274–280.
- APGsystem III (2009). "An Updated of the Angiosperm Phylogeny Group Classification for the Orders and Families of Flowering Plants". *Bot. J. Linnean Soc.*, **161**,105-121.
- Arab Encyclopaedia (2005). Web By B. O. C. International Copyright.
- Aronson, W.J.; Glaspy, J.A.; Reddy, S.T.; Reese, D.; Heber, D.; Bagga, D. (2001). "Modulation of Omega-3/Omega-6 Polyunsaturated Ratios with Dietary Fish Oils in Men with Prostate Cancer". *Urology*, **58** (2), 283-288.
- Bauer, N.; Fulgost, H.; Jelaska, S. (2011). Overexpression of phenylalanine aminonia. lyase in transgenic roots of coleus blumei alters growth and rosmarinic acid squtheis. *Food. Technol. Bio tecchnol.* **49**(1), 24 – 31.
- Connor, W.E. (2000). Importance of n-3 Fatty acids in health and disease. *Americ. J. Clinic. Nutr.* **71**(1), 171S-175S.
- Dalgarno, B.; Birt, L.M. (1963). Free fatty acids in carrot- tissue preparations and their effect on isolated carrot mitochondria. *Biochem. J.* **87**, 586.
- Food and Agriculture Organization of the United Nations, FAOSTAT data, 2011. <http://faostat.fao.org/site/567/DesktopDefault.aspx?PageID=567#ancor>
- George, E.F.; Hall, M.A.; De Klerk, G. (2008). " Plant Propagation By Tissue Culture". 3rd ed. Volume 1. The Background, Springer.
- Iso, H.; Sato, S.; Umemura, U.; Kudo, M.; Koike, K.; Kitamura, A.; Imano, H.; Okamura, T.; Naito, Y. ; Shi-mamoto, T. (2002). Linoleic acid, other fatty acids, and the risk of stroke. *Stroke.* **33**, 2086-2093.
- Li, H.; Parry, J.W. (2011). Phytochemical compositions, antioxidant properties, and colon cancer anti proliferation effects of turkish and oregon hazelnut. *Food and Nutrition Sci.*, **2**, 1142-1149.
- Mohammad, A.M.S. (1971). Physiological Aspects of Cotyledonary Senescence in *Phaseolus vulgaris* L. Ph. D. Thesis/University of Liverpool/England.
- Mok, M.C.; Martin, R.C.; Mok, W.S. (2000). Cytokinins: biosynthesis, metabolism and perception. in vitro cell. dev. *Biol. Plant* **36**,102–107.

- Murashige, T.; Skoog, F. (1962). A Revised medium for rapid growth and bioassays with tobacco tissue culture. *Physiol. Plant*, **15**, 473-497.
- Ozdemir, M.; Ackurt, F.; Kaplan, M.; Yildiz, M.; Loker, M.; Gurcan, T.; Biringen, G.; Okay, A.; Seyhan, F.G. (2001). Evaluation of new turkish hybrid hazelnut (*Corylus avellana* L.) varieties: fatty acid composition, toco-pherol content, mineral composition and stability. *Food Chemistry*, **73**, 411-415.
- Pierik, R.L.M. (1997). "In Vitro Culture of Higher Plants". Mart inus Nigh off Publishers. Canada.
- Qaderi, A.; Omidi, M.; Etminan, A.; Oladzad, A.; Ebrahimi, C.; Dehghai, M.MR.; Mehrafarin, A. (2012). Hazel (*Corylus avellana* L.) as a new source of Taxol and Taxanes. *J. Medicinal plants*.**11** (41).
- Quarta, A.; Mita, G.; Santino, A.; Depaolis, A. (2007). "Molecular and Biochemical Characterisation of Lipoxygenase Gene Family in Hazelnut (*Corylus avellana*)". Proceedings of the 51st Italian Society of Agricultural Genetics Annual Congress Riva Del Garda, Poster Abstract-D. 81
- Schmülling, T. (2004). Cytokinin. In *Encyclopedia of Biological Chemistry*. Academic Press/Elsevier Science.
- Shaw, N. (1974). Lipid composition as a guide to the classification of bacteria. *Adv. Appl. Microbiol.* **17**, 63-108.
- Smith, T.M.; Brooks, T.J.; White, H.B. (1969). Fatty acid composition of adult *Schistosomamanson*. *Lipids*. **4**, 31-36.
- Stahl, L. (2007). *Third Crop Options*, Hybrid Hazelnuts. Rural Advantage, 1243 Lake Ave. Suite 222, Fairmont, MN 560.