This article was downloaded by: *[aksu, muhammet Irfan]*
On: *1 June 2011*
Access details: *Access Details: [subscription number 938295874]*
Publisher *Taylor & Francis*
Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



Journal of Applied Animal Research
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t924355791

Effects of different fat sources and levels on the fatty acid composition in different tissues of laying hens

Saban Celebi[a]; Necati Utlu[b]; M. İrfan Aksu[a]
[a] Zootekni Bölümü Atatürk Üniversitesi Ziraat Fakültesi, Erzurum, Turkey [b] Tıbbi Laboratuvar Programı, Atatürk Üniversitesi SaglIk Hiz M.Y. O, Erzurum, Turkey

Online publication date: 01 June 2011

To cite this Article Celebi, Saban , Utlu, Necati and Aksu, M. İrfan(2011) 'Effects of different fat sources and levels on the fatty acid composition in different tissues of laying hens', Journal of Applied Animal Research, 39: 1, 25 — 28
To link to this Article: DOI: 10.1080/09712119.2011.565219
URL: http://dx.doi.org/10.1080/09712119.2011.565219

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: http://www.informaworld.com/terms-and-conditions-of-access.pdf

This article may be used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

Journal of Applied Animal Research,
Vol. 39, No. 1, March 2011, 25–28

Taylor & Francis
Taylor & Francis Group

Effects of different fat sources and levels on the fatty acid composition in different tissues of laying hens

Saban Celebi[a], Necati Utlu[b]* and M. İrfan Aksu[a]

[a]*Zootekni Bölümü Atatürk Üniversitesi Ziraat Fakültesi, Erzurum, Turkey;* [b]*Tıbbi Laboratuvar Programı, Atatürk Üniversitesi SaglIk Hiz M.Y. O, Erzurum, Turkey*

(*Received 2 February 2010; final version received 16 October 2010*)

To examine the effects of supplemental fat on fatty acid (FA) compositions of some tissues, laying hens were fed diets containing different fat sources (tallow, mixture of tallow and flaxseed oil [1:1], sunflower oil, flaxseed oil) and levels (2% or 4%); 360 Isa Brown hens were assigned to one of the nine diets. The dietary FA composition was reflected in the FA composition of tissue lipids. The supplemental tallow oil increased concentrations of saturated fatty acids. The proportions of linoleic and arachidonic acids in all tissues for laying hens fed a diet containing sunflower oil (SO) were higher than the other diets. Moreover, increasing the SO level increased the n-6 FAs content. Also, dietary flaxseed oil significantly increased the content of linolenic and other n-3 FAs in most studied tissues. These results indicated that desirable changes can be achieved in FA compositions of poultry meats by using various animal and plant fats in poultry diets.

Keywords: laying hen; dietary fat; fatty acid profile; tissues

Downloaded By: [aksu, muhammet Irfan] At: 20:29 1 June 2011

Introduction

Fats are a practical and economical means by which to increase energy levels in poultry diets. Digestibility of dietary fats is affected by the fatty acid profiles; several studies have shown better utilisation of unsaturated fats leading to a higher ME (metabolic energy) than saturated fats (Celebi and Utlu 2004; Utlu 2008). Dietary fats are known to influence body membrane, tissues and egg yolk lipid composition and plasma lipoprotein concentrations depending on their constructive unsaturated or saturated fatty acid content. Due to the health benefits associated with the consumption of polyunsaturated fatty acids (PUFAs), much research has been done in the past to enrich different foods of animal origin, such as poultry meat or eggs, with such fatty acids (Baucells et al. 2000; Celebi and Utlu 2004; Celebi and Macit 2008; Utlu 2008). The biochemical pathway of fatty acid biosynthesis or tissue deposition may be influenced by the nature of dietary fatty acids. Factors other than diet, such as age and strain of the bird, may affect lipid metabolism in the laying hen (Baucells et al. 2000; Celebi and Utlu 2004; Celebi and Macit 2008; Utlu 2008). It has been known for more than five decades that broiler meat and yolk fatty acids can be easily altered by dietary manipulation.

Layers meat is also consumed widely in many developing countries by humans after the laying period. Composition of the layers meat has not been reported in the scientific literature. Therefore, the objective of this study was to investigate the effects of different dietary fat sources on the FA composition of laying hens in the late laying period.

Materials and methods

The Research Animal Ethic Committee of Atatürk University approved all procedures under this experimental protocol. Three hundred and sixty Isa Brown Layers (67 weeks) were assigned randomly to nine experimental diets. The control group (BD) were fed standard commercial layer feed (ME: 2650 kcal/kg-CP 16%). Other experimental diets were prepared by supplementing a basal diet (BD) with either 2% tallow (T-1), 4% tallow (T-2), 2% mixture of tallow and flaxseed oil (w/w) (MTFO-1), 4% mixture of tallow and flaxseed oil (w/w) (MTFO-2), 2% sunflower oil (SO-1), 4% sunflower oil (SO-2), 2% flaxseed oil (FO-1), and 4% flaxseed oil (FO-2), respectively. The experimental diets were formulated to be isonitrogenous but not isocaloric. During the experimental period, hens were fed *ad libitum* once daily at 08:00 h and water nipples were available all the times. The hen house was lit for 16 h.

At the end of the eight week experimental period, three hens were slaughtered from each group to determine fatty acid composition of abdominal fat,

*Corresponding author. Email: necatiutlu@mynet.com

ISSN 0971-2119 print/ISSN 0974-1844 online
© 2011 Taylor & Francis
DOI: 10.1080/09712119.2011.565219
http://www.informaworld.com

Table 1. Effect of dietary fat supplementation on fatty acid composition of abdominal fat in laying hens (%).

Fatty acids (%)[b]/Groups[a]	BD	T-1	T-2	MTFO-1	MTFO-2	SO-1	SO-2	FO-1	FO-2	SEM	P
Myristic acid (C14:0)	0.75^{d}	3.18^{b}	4.08^{a}	3.14^{b}	2.86^{c}	0.33^{e}	0.31^{e}	0.40^{e}	0.49^{e}	0.06	*
Palmitic acid (C16:0)	27.00^{a}	25.00^{bc}	26.00^{b}	23.72^{c}	23.80^{c}	21.08^{d}	20.41^{d}	20.85^{d}	20.34	0.25	*
Palmitoleic acid (C16:1)	7.79^{a}	6.51^{bc}	6.0^{c}	6.01^{c}	6.81^{b}	5.83^{c}	5.04^{d}	5.52^{dc}	5.19^{d}	0.13	*
Stearic acid (C18:0)	7.96^{c}	8.75^{b}	9.27^{a}	7.77^{c}	7.92^{c}	7.53^{c}	7.92^{c}	6.54^{d}	6.50^{d}	0.17	*
Oleic acid (18:1)	32.00^{d}	39.00^{c}	41.00^{a}	40.73^{b}	39.92^{bc}	29.04^{de}	29.00^{de}	29.58^{e}	30.47^{e}	0.22	*
Linoleic acid (C18:2)	21.00^{d}	14.00^{de}	12.85^{f}	14.44^{e}	13.81^{de}	33.88^{b}	34.02^{a}	24.80^{c}	20.56^{d}	0.20	*
Linolenic acid (C18:3)	0.73^{c}	0.34^{e}	0.36^{e}	0.39^{e}	0.70^{c}	0.70^{c}	0.53^{d}	7.42^{b}	8.10^{a}	0.08	*
Arachidonic acid (C20:4 n-6)	0.83^{b}	0.80^{b}	0.78^{b}	0.75^{b}	0.75^{b}	1.29^{a}	1.28^{a}	0.26^{c}	0.32^{c}	0.04	*
Eicosapentaenoic acid (20:5 n-3)	0.08^{c}	0.055^{d}	0.063^{d}	0.060^{d}	0.05^{d}			1.57^{b}	1.80^{a}	0.06	*
Docosapentaenoic acid (22:5 n-3)	0.34^{d}	0.59^{cd}	0.64^{c}	0.64^{c}	0.81^{b}			0.83^{b}	0.89^{a}	0.02	*
Docosahexaenoic acid (22:6 n-3)	0.24^{g}	0.34^{ef}	0.42^{e}	0.44^{d}	0.51^{c}	0.31^{f}	0.35^{ef}	0.53^{b}	0.66^{a}	0.05	*
ΣSFA	35.71	36.93	39.35	34.63	34.58	28.94	28.66	27.79	27.33		
ΣMUFA	39.79	45.51	46.00	46.74	46.73	34.87	34.04	35.10	35.66		
ΣPUFA	23.22	16.12	15.13	16.70	16.63	36.18	37.18	36.86	36.33		
Σn-6 PUFA	21.83	14.80	13.63	15.19	14.56	35.17	36.30	22.06	20.88		
Σn-3 PUFA	1.39	1.32	1.50	1.51	2.07	1.01	0.88	10.30	11.45		

[a]BD = basal diet; T-1 = basal diet plus 2% tallow; T-2 = basal diet plus 4% tallow; MTFO-1 = basal diet plus 2% mixture of tallow and flaxseed oil (w/w); MTFO-2 = basal diet plus 4% mixture of tallow and flaxseed oil (w/w); SO-1 = basal diet plus 2% sunflower oil; SO-2 = basal diet plus 4% sunflower oil; FO = basal diet plus 2% flaxseed oil; FO = basal diet plus 4% flaxseed oil.
[b]n-3 = omega-3 fatty acid; n-6 = omega-6 fatty acid; SFA = saturated fatty acid; MUFA = monounsaturated fatty acids; PUFA = polyunsaturated fatty acid.
*$P < 0.05$. Different superscript italic letters within the same column differ ($P < 0.05$). SEM = standard error of means.

Downloaded By: [aksu, muhammet Irfan] At: 20:29 1 June 2011

subdermal fat, breast and thigh muscles. Samples were taken from each tissue for extraction. After extracting dietary fats, tissue samples were methylated for gas chromatographic analysis (GC, Agilent-6890 N chromatograph equipped with a flame ionisation detector, a capillary column, and a film thickness of 2 mm). Injector and detector temperature was 280°C head pressure was 8.7 psi, sample volume was 1 ml.

Data were subjected to ANOVA and simple correlation analysis using the statistical package SPSS, version 6.0.

Results and discussion

Both supplemental fat sources and levels significantly ($P < 0.05$) affected the FA compositions of all tissues

Table 2. Effect of dietary fat supplementation on fatty acid composition of subdermal fat in laying hens (%).

Fatty Acids[b]/Groups[a]	BD	T-1	T-2	MTFO-1	MTFO-2	SO-1	SO-2	FO-1	FO-2	SEM	*P*
Myristic acid (C14:0)	0.76^{e}	2.82^{b}	3.33^{a}	2.18^{d}	2.64^{bc}	2.47^{c}	2.44^{c}	2.45^{c}	2.53^{c}	0.067	*
Palmitic acid (C16:0)	27.00^{a}	25.41^{c}	26.20^{b}	24.85^{d}	23.00^{e}	22.38^{f}	21.53^{ef}	21.89^{ef}	21.44^{ef}	0.28	*
Palmitoleic acid (C16:1)	7.58^{a}	6.30^{c}	6.33^{c}	6.70^{b}	6.63^{b}	6.84^{b}	5.87b^{c}	6.11^{bc}	6.34^{c}	0.13	*
Stearic acid (C18:0)	7.75^{e}	9.19^{b}	9.54^{a}	8.74^{c}	8.84^{c}	7.80^{d}	8.01^{d}	7.28^{f}	7.18^{f}	0.16	*
Oleic acid (18:1)	32.76^{d}	35.00^{b}	37.39^{a}	33.06^{d}	33.90^{c}	29.18^{e}	28.98^{e}	28.51^{e}	28.54^{e}	0.41	*
Linoleic acid (C18:2)	21.24^{c}	19.03^{e}	17.21^{f}	19.30^{e}	20.06^{d}	27.69^{b}	29.52^{a}	21.59^{c}	20.6^{d}	0.46	*
Linolenic acid (C18:3)	0.76^{c}	0.28^{d}	0.39^{d}	0.39^{d}	0.57^{c}	0.54^{c}	0.62^{c}	6.45^{b}	7.89^{a}	0.047	*
Arachidonic acid (C20:4 n-6)	0.84^{c}	0.77^{c}	0.76^{c}	0.75^{c}	0.73^{c}	1.60^{b}	1.90^{a}	0.33^{d}	0.36^{d}	0.28	*
Eicosapentaenoic acid (20:5 n-3)	0.08^{d}	0.06^{d}	0.06^{d}	0.06^{d}	0.66^{c}			1.86^{b}	2.08^{a}	0.039	*
Docosapentaenoic acid (22:5 n-3)	0.34^{e}	0.62^{d}	0.67^{c}	0.68^{c}	0.72^{c}			0.92^{b}	0.98^{a}	0.019	*
Docosahexaenoic acid (22:6 n-3)	0.32^{f}	0.45^{d}	0.53^{c}	0.52^{c}	0.54^{c}	0.34^{f}	0.42^{e}	0.57^{b}	0.61^{a}	0.012	*
ΣSFA	35.51	37.42	39.07	35.77	34.48	32.60	31.98	31.67	31.15		
ΣMUFA	40.34	41.30	43.52	40.30	40.53	36.02	34.85	34.62	34.88		
ΣPUFA	23.58	21.21	19.62	21.70	22.67	30.17	32.46	31.72	32.78		
Σn-6 PUFA	22.03	19.80	17.97	20.05	20.79	29.29	31.42	22.25	21.55		
Σn-3 PUFA	1.5	1.41	1.65	1.65	2.39	0.88	1.04	9.47	11.57		

[a]BD = basal diet; T-1 = basal diet plus 2% tallow; T-2 = basal diet plus 4% tallow; MTFO-1 = basal diet plus 2% mixture of tallow and flaxseed oil (w/w); MTFO-2 = basal diet plus 4% mixture of tallow and flaxseed oil (w/w); SO-1 = basal diet plus 2% sunflower oil; SO-2 = basal diet plus 4% sunflower oil; FO = basal diet plus 2% flaxseed oil; FO = basal diet plus 4% flaxseed oil.
[b]n-3 = omega-3 fatty acid; n-6 = omega-6 fatty acid; SFA = saturated fatty acid; MUFA = monounsaturated fatty acids; PUFA = polyunsaturated fatty acid.
*$P < 0.05$. Different superscript italic letters within the same column differ ($P < 0.05$). SEM = standard error of means.

Table 3. Effect of dietary fat supplementation on fatty acid composition of breast muscle in laying hens (%).

Fatty Acids[b]/Groups[a]	BD	T-1	T-2	MTFO-1	MTFO-2	SO-1	SO-2	FO-1	FO-2	SEM	*P*
Myristic acid (C14:0)	0.70^{f}	2.19^{d}	2.26^{c}	2.60^{b}	2.94^{a}	1.43^{e}	1.47^{e}	1.50^{e}	1.47^{e}	0.089	*
Palmitic acid (C16:0)	26.23^{d}	28.19^{b}	29.00^{a}	27.22^{c}	27.37^{c}	27.09^{c}	27.16^{c}	26.00^{d}	25.50^{d}	0.27	*
Palmitoleic acid (C16:1)	8.71^{ab}	8.23^{b}	7.99^{b}	8.87^{a}	8.06^{b}	7.69^{c}	7.94^{c}	7.81^{c}	7.04^{d}	0.103	*
Stearic acid (C18:0)	$7.43b^{c}$	8.15^{b}	9.28^{a}	7.83^{b}	7.97^{b}	7.10^{c}	7.94^{b}	7.18^{c}	7.03^{c}	0.16	*
Oleic acid (18:1)	31.83^{b}	34.19^{a}	34.08^{a}	30.97^{bc}	30.26^{c}	30.50^{c}	28.48^{d}	28.39^{d}	28.09^{d}	0.37	*
Linoleic acid (C18:2)	20.70^{c}	18.18^{d}	17.02^{d}	19.51^{cd}	20.30^{c}	22.71^{b}	24.38^{a}	20.38^{c}	20.76^{c}	0.53	*
Linolenic acid (C18:3)	0.82^{d}	0.42^{f}	0.42^{f}	0.79^{d}	0.92^{c}	0.64^{e}	0.60^{e}	4.86^{b}	5.87^{a}	0.034	*
Arachidonic acid (C20:4 n-6)	0.72^{c}	0.70^{c}	0.62^{d}	0.57^{d}	0.76^{c}	1.48^{b}	1.68^{a}	0.49^{e}	0.48^{e}	0.06	*
Eicosapentaenoic acid (20:5 n-3)	0.07^{d}	0.06^{e}	0.05^{e}	0.20^{c}	0.34^{b}			0.8^{a}	0.9^{a}	0.055	*
Docosapentaenoic acid (22:5 n-3)	0.54^{c}	0.49^{d}	0.31^{e}	0.55^{c}	0.61^{c}			0.77^{b}	0.81^{a}	0.046	*
Docosahexaenoic acid (22:6 n-3)	0.38^{d}	0.45^{c}	0.42^{c}	0.38^{d}	0.51^{b}	0.43^{c}	0.30^{e}	0.59^{b}	0.67^{a}	0.028	*
ΣSFA	34.36	38.53	40.54	37.65	38.28	35.62	36.57	34.68	34.00		
ΣMUFA	40.54	41.42	42.07	39.84	38.32	38.19	36.42	37.19	29.87		
ΣPUFA	23.24	20.30	17.39	22.03	23.04	25.36	27.01	28.03	21.87		
Σn-6 PUFA	21.42	18.88	16.19	20.11	21.06	24.19	26.05	20.87	21.24		
Σn-3 PUFA	1.82	1.42	1.20	1.99	2.32	1.07	0.95	7.06	8.63		

[a]BD = basal diet; T-1 = basal diet plus 2% tallow; T-2 = basal diet plus 4% tallow; MTFO-1 = basal diet plus 2% mixture of tallow and flaxseed oil (w/w); MTFO-2 = basal diet plus 4% mixture of tallow and flaxseed oil (w/w); SO-1 = basal diet plus 2% sunflower oil; SO-2 = basal diet plus 4% sunflower oil; FO = basal diet plus 2% flaxseed oil; FO = basal diet plus 4% flaxseed oil.
[b]n-3 = omega-3 fatty acid; n-6 = omega-6 fatty acid; SFA = saturated fatty acid; MUFA = monounsaturated fatty acids; PUFA = polyunsaturated fatty acid.
*$P < 0.05$. Different superscript italic letters within the same column differ ($P < 0.05$). SEM = standard error of means.

Downloaded By: [aksu, muhammet Irfan] At: 20:29 1 June 2011

in diverse ways (Tables 1, 2, 3 and 4), depending on the compositions of dietary fats and regardless of tissue types. Generally, the FA profile of different tissues reflected the dietary FA profile. Hens fed a diet containing TO presented higher values of saturated fatty acids (SFA; mainly, myristic, palmitic and stearic acids) than those fed BD, MTFO, SO and FO diets. The proportions of these FAs were increased by increasing dietary TO levels (from 2% to 4%) in all tissues. Tallow oil supplementation also increased the σn-3 fatty acids. Also, hens fed diets containing TO presented a higher value of monounsaturated fatty acids (MUFA) than the rest of the treatments in studied tissues. Moreover, the highest value of oleic acid was observed in hens fed a 4% TO diet in abdominal fat. These results were in accordance with previous reports that adipose tissues more closely reflected composition of the diet than did muscles

Table 4. Effect of dietary fat supplementation on fatty acid composition of thigh muscle in laying hens (%).

Fatty Acids[b]/Groups[a]	BD	T-1	T-2	MTFO-1	MTFO-2	SO-1	SO-2	FO-1	FO-2	SEM	*P*
Myristic acid (C14:0)	1.40^{c}	2.19^{b}	2.80^{a}	2.18^{b}	2.14^{b}	2.13^{b}	2.17^{b}	2.14^{b}	2.17^{b}	0.089	*
Palmitic acid (C16:0)	26.23^{c}	28.10^{b}	29.32^{a}	28.22^{b}	27.57^{bc}	26.09^{c}	26.36^{c}	26.75^{c}	26.50^{c}	0.27	*
Palmitoleic acid (C16:1)	8.75^{a}	8.23^{b}	7.99^{bc}	8.87^{a}	8.06^{bc}	8.19^{b}	7.74^{bc}	7.71^{bc}	7.24^{c}	0.103	*
Stearic acid (C18:0)	7.45^{d}	8.15^{b}	8.88^{a}	8.03^{b}	7.97^{bc}	7.43^{bc}	$7.\ 80^{c}$	6.28^{d}	6.28^{d}	0.16	*
Oleic acid (18:1)	31.83^{b}	32.21^{ab}	32.68^{a}	30.57^{bc}	30.76^{bc}	29.20^{bc}	27.75^{d}	29.58^{a}	28.09^{c}	0.37	*
Linoleic acid (C18:2)	21.30^{c}	18.18^{de}	17.09^{e}	19.21^{d}	20.30^{c}	23.81^{b}	25.16^{a}	20.38^{c}	19.76^{d}	0.53	*
Linolenic acid (C18:3)	0.82^{cd}	0.45^{f}	0.43^{f}	0.80^{d}	0.88^{c}	0.54^{e}	0.43^{f}	5.06^{b}	6.17^{a}	0.034	*
Arachidonic acid (C20:4 n-6)	0.72^{c}	0.75^{c}	0.55^{cd}	0.63^{cd}	0.66^{d}	1.48^{b}	1.76^{a}	0.49^{e}	0.48^{e}	0.06	*
Eicosapentaenoic acid (20:5 n-3)	0.07^{e}	0.06^{e}	0.05^{e}	0.28^{d}	0.41^{c}			0.85^{b}	0.98^{a}	0.055	*
Docosapentaenoic acid (22:5 n-3)	0.50^{dc}	0.45^{dc}	0.42^{c}	0.59^{d}	0.71^{b}			0.78^{b}	0.97^{a}	0.046	*
Docosahexaenoic acid (22:6 n-3)	0.40^{e}	0.45^{de}	0.48^{d}	0.50^{dc}	0.65^{b}	0.53^{c}	0.49^{d}	0.69^{ab}	0.74^{a}	0.028	*
ΣSFA	35.08	38.53	41.00	38.43	37.68	35.65	36.33	35.13	34.82		
ΣMUFA	40.57	40.52	40.67	39.44	38.82	37.40	35.45	37.28	35.30		
ΣPUFA	23.91	20.38	18.88	21.87	23.04	26.68	27.73	27.56	29.10		
Σn-6 PUFA	21.00	18.93	17.64	19.74	20.76	25.29	26.58	20.20	20.24		
Σn-3 PUFA	1.91	1.41	1.46	2.17	2.29	1.39	1.15	7.38	8.86		

[a]BD = basal diet; T-1 = basal diet plus 2% tallow; T-2 = basal diet plus 4% tallow; MTFO-1 = basal diet plus 2% mixture of tallow and flaxseed oil (w/w); MTFO-2 = basal diet plus 4% mixture of tallow and flaxseed oil (w/w); SO-1 = basal diet plus 2% sunflower oil; SO-2 = basal diet plus 4% sunflower oil; FO = basal diet plus 2% flaxseed oil; FO = basal diet plus 4% flaxseed oil.
[b]n-3 = omega-3 fatty acid; n-6 = omega-6 fatty acid; SFA = saturated fatty acid; MUFA = monounsaturated fatty acids; PUFA = polyunsaturated fatty acid.
*$P < 0.05$. Different superscript italic letters within the same column differ ($P < 0.05$). SEM = standard error of means.

tissue (Huang et al. 2006). Hens receiving MTFO diets had a significant change in the FA compositions of all tissues. The presence of FO in the mixture significantly increased the accumulation of n-3 FAs. The MTFO supplemented with diets presented the higher values of n-3 FAs (linolenic acid [LNA], Eicosapentaenoic acid [EPA], Docosapentaenoic acid [DPA] and Docosahexaenoic acid [DHA]) than those fed BD, TO-1, TO-2, SO-1 and SO-2 diets. For example, feeding a 4% MTFO diet increased the amount of n-3 PUFAs about 1.5 and 2.3 times compared with BD and SO diets, respectively. The highest value of LNA was observed in breast muscle. However, the highest value of DHA was obtained from subdermal fat for layers fed 4% MTFO compared with BD, TO and SO diets. These results could be explained by the FA content of the flaxseed oil, because FO contains a higher level (49.32%) of LNA than TO (0.33%) and SO (0.10%). It is well know that LNA is the precursors of other n-3 long chain PUFAs such as EPA, DPA and DHA. On the other hand, MTFO supplemented with the diet decreased total MUFAs as compared with SO and FO diets. Celebi and Macit (2008) reported that layers fed 2% MTFO increased σn-3 fatty acids in egg yolk compared with control, TO and SO diets. Similarly, Baucells et al. (2000) reported that hens fed a 4% MTFO significantly increased the levels of σn-3 fatty acid in egg yolk as compared with hens fed control and other diets.

Sunflower oil containing a high proportion of LA (58.98%) significantly influenced FA composition of tissues. Hens fed the SO diet showed higher values of linoleic acid (18:2 n-6) and arachidonic acid (20:4 n-6) than those fed tallow, mixture oil and FO in almost all studied tissues. The abdominal and subdermal fats produced higher level of n-6 FAs than breast and thigh muscles. These results were in agreement with previous reports that adipose tissue more closely reflected composition of the diet than did muscle tissues (Huang et al. 2006). Utlu (2008) reported that geese fed diets containing 0%, 2%, 4% and 6% SO significantly increased the values of LA, AA and σn-6 FAs in skin, breast and launch muscles compared with the control group. Although, hens fed the SO diet had a significant effect on the n-6 LC-PUFAs such as LA and AA content in tissues, the same effect did not result in longer chain n-3 FAs. Moreover, the metabolites of LNA such as EPA, DPA and DHA were not detected in studied tissues. In this study, σn-3 PUFA and long chain n-3 PUFAs such as EPA, DPA and DHA were significantly ($P < 0.05$) affected from dietary treatments. The LNA and other FAs of n-3 series were higher for layers fed a diet containing FO than those fed the BD and diets containing other dietary fats in all studied tissues. Feeding FO significantly ($P < 0.05$) increased the n-3 FAs content many-fold in all tissues by increasing FO levels from 2% to 4%. For example, the deposition of σn-3 FAs for hens fed the 4% FO diet was about 12-fold than that of hens fed a 4% SO diet in subdermal fat. The highest value of LNA and other n-3 LC-PUFAs were found in abdominal and subdermal fats of hens fed a high level of FO in diet whereas, the lowest values of n-6 FAs were observed in same group. Also, hens fed on the 4% FO diet had a significantly higher EPA and DHA in all studied tissues than hens fed BD and other dietary fats. These results were in accordance with previous reports that the FA concentration of different tissues reflects the FA composition of the diet. Lamber et al. (2006) reported that hen broilers given a diet containing 0%, 2.5% and 3.5% FO, n-3 FAs content was increased many-fold but 2.5% and 3.5% FO additives in a diet decreased the content of SFA and MUFA in the skin, in subdermal fat, internal fat and thigh muscle fat of female and male birds.

The results of this study suggested that dietary FA profiles play an important role in lipid deposition and metabolism, the desirable changes could be achieved in FA concentrations of poultry meats by using various vegetables oil in poultry diets.

References

Baucells MD, Crespo N, Barroeta AC, Lopes S, Groshorn MA. 2000. Incorporation of different polyunsaturated fatty acids into eggs. Poultry Science 79:51–59.

Celebi S, Macit M. 2008. The effects of supplemental fat on performance, egg quality and fatty acid composition of egg yolk in laying hens. Journal of the Science of Food and Agriculture 88:2382–2387.

Celebi S, Utlu N. 2004. Laying performance, serum lipoproteins, cholesterol and triglyceride of hens as influenced by dietary fat sources. Journal of Applied Animal Research 25:121–124.

Huang SE, Huang CC, Lar MK, Lin SH, Lee CH, Vang TY. 2006. Effect's of dietary fish oil on the contents of eicopentoenoic acid and dokosohexaenoic acid and sensory evaluation of the breast meat in mule ducks. Asian-Australasian Journal of Animal Sciences 19: 231–235.

Lamber A, Tik H, Tamm K, Karus A, Kuusik S, Rie M. 2006. The use of linseed oil in enriching the lipids of hen broiler, quail and rabbit meat with n-3 fatty acids. Agraarteadus, XVII: 23–67.

Utlu N. 2008. Influence of different levels of sunflower oil containing on fatty acids composition of geese meat. Indian Veterinary Journal 85:1063–1066.

Downloaded By: [aksu, muhammet Irfan] At: 20:29 1 June 2011