Canola oil and its effect on the EPA and DPA content of abdominal fat of Iranian native turkey

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Abstract: The aim of this research were to evaluated effect of canola oil on the EPA and DHA fatty acid contents in the abdominal fat of Iranian native turkeys. A total of 90 turkey chicks were randomly divided into 3 experimental treatments with 3 replicates were arranged in a completely randomized design. The experimental period lasted 20 weeks. Experimental diets consisted of: Basal diet with 0% canola oil; basal diet with 2.5% canola oil and basal diet with 5% canola oil. Results show that different level of canola oil could not affect significantly EPA and DHA content but DPA percent significantly increased in experimental treatments compare with control group.
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1. Introduction

Omega-3 fatty acids (n-3) are a group of polyunsaturated fatty acids (PUFA) which include α-linolenic acid (ALA, C18:3 n-3), its long chain metabolites eicosapentaenoic acid (EPA, C20:5 n-3) and docosahexaenoic acid (DHA, C 22:6 n-3). Humans can synthesize EPA and DHA through desaturation and elongation of ALA [1]. However, this conversion has been found to be limited [2]. Major sources of ALA include the seeds and oils of flaxseed, soybean and canola, with flaxseed containing 50-60% ALA [3]. EPA and DHA are obtained in the diet from aquatic and marine products only such as fish, shellfish, algae and their oils[4]. Increased knowledge of the health benefits of omega-3 fatty acids especially EPA and DHA has led to a growing demand for products rich in omega-3 fatty acids [5]. Abdominal fat are excellent sources for fat which are one of the components of the diet of individuals living in the developed countries [6]. Some of vegetable oils such as canola oil enriched with the perfect balance between omega 3 fatty acids and omega 6 fatty acids. How ever the aim of this research were evaluate canola oil effects on the incorporated DHA and EPA fatty acid to abdominal fat and increase their omega-3 PUFA contents.

2. Material and methods

Animals and Diets

Ninety Iranian native turkey male chicks were divided into 3 groups of 30 chicks each. One group was fed a control diet and the other two with two different experimental diets enriched in omega-3 fatty acids (diet 1 containing 2.5% canola oil and diet 2 containing 5% canola oil are given in Table 1 The experimental diets formulated isonitrogenouse and isoenergetic, accordance with the 1994 recommendations of the National Research Council (table 1). Fattening period was performed at four period 4-8, 8-12, 12-16 an 16-20 week.

Abdominal Fat

Abdominal fat pad (including fat surrounding gizzard, bursa of Fabricius, cloaca, and adjacent muscles) was removed at 20 wk of age for turkeys. The abdominal fat was stored at −20 C until analysis. Fatty acid composition was determined by gas chromatography (GC).

Gas chromatography of fatty acids methyl esters

Sample preparation

Total lipid was extracted from breast and thigh according to the method of Folch [8]. Approximately 0.5 g of meat weighed into a test tube with 20 mL of (chloroform: methanol = 2:1, vol/vol), and homogenized with a poltroon for 5 to 10 s at high speed. The BHA dissolved in 98% ethanol added prior to homogenization. The homogenate filtered through a Whatman filter paper into a 100-mL graduated cylinder and 5 mL of 0.88% sodium chloride solution added, stopper, and mixed. After phase separation, the volume of lipid layer recorded, and the top layer completely siphoned off. The total lipids converted to fatty acid methyl esters (FAME) using a mixture of boron-trifluoride, hexane, and methanol (35:20:45, vol/vol/vol). The FAME separated and quantified by an automated gas chromatography equipped with auto sampler and flame ionization detectors, using a 30 m´ 0.25 mm inside diameter fused silica capillary column, as described. A (Model 6890N American Technologies Agilent) (U.S.A) Gas chromatography used to integrate peak areas. The calibration and identification of fatty acid peak carried out by comparison with retention

times of known authentic standards. The fatty acid results form gas chromatography with Chem Station software analyzed and expressed as weight percentages.

Table2: Least square means for EPA, DPA and DHA fatty acids in turkey abdominal fat

	Treatments				
	control	2.5	5	P value	SEM
EPA	2.8226 a	2.4456 a	2.0535 a	0.6334	0.5483
DPA	3.2516 c	6.9323 b	8.0224 a	0.0001	0.2636
DHA	2.3414 a	2.5786 a	2.6517 a	0.7924	0.3301

TABLE 1. Percentage composition of experimental diets in four period

	4 -8 week			8 - 12 week			12 - 16 week			16 - 20 week		
Ingredients'	**T1**	**T2**	**T3**	**T1**	**T2**	**T3**	**T1**	**T2**	**T3**	**T1**	**T2**	**T3**
Corn	42.50	38.00	36.00	45.60	43.00	35.00	56.64	48.50	40.00	64.41	58.00	48.00
SBM	34.40	36.00	31.15	28.25	27.30	28.24	26.00	27.00	27.50	21.00	21.00	21.00
Oi	0.00	1.25	2.50	0.00	2.50	5.00	0.00	2.50	5.00	0.00	2.50	5.00
Fish	4.80	3.70	6.60	8.00	8.00	8.00	2.64	1.82	1.50	0.65	0.70	0.67
Starch	3.10	3.22	1.56	7.46	3.32	3.37	6.57	6.51	6.50	7.10	5.56	6.71
Alfalfa	3.47	5.00	6.00	3.00	5.00	6.00	1.50	4.00	6.00	1.00	3.80	6.00
DCP	1.38	1.52	1.11	0.63	0.61	0.62	1.03	1.15	1.18	1.17	1.15	1.15
Met	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Lys	1.50	1.50	1.50	1.50	1.50	1.50	1.40	1.50	1.50	1.50	1.50	1.50
Oyster	1.02	1.02	0.86	0.73	0.67	0.62	0.92	0.87	0.82	0.90	0.81	0.73
wheat bran	2.00	3.00	6.00	2.50	5.00	6.00	1.00	3.00	6.00	0.00	1.70	5.00
Vit supp[1]	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Min supp[2]	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Sand	3.58	3.54	4.47	0.08	0.85	3.40	0.05	0.90	1.75	0.02	1.03	1.99
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Calculated nutrient content												
ME kcal/kg	2755	2755	2755	2850	2850	2850	2945	2945	2945	3040	3040	3040
Crude protein (%)	24.7	24.7	24.7	20.9	20.9	20.9	18.1	18.2	18.1	15.7	15.7	15.7
Calcium (%)	0.95	0.95	0.95	0.81	0.81	0.81	0.71	0.71	0.71	0.62	0.62	0.62
Available P (%)	0.48	0.48	0.48	0.40	0.40	0.40	0.36	0.36	0.36	0.31	0.31	0.31
ME/CP	112	112	112	136	136	136	163	162	163	194	194	194
Ca/P	2	2	2	2	2	2	2	2	2	2	2	2

1Vitamin content of diets provided per kilogram of diet: vitamin A,D, E and K.
2 Composition of mineral premix provided as follows per kilogram of premix: Mn, 120,000mg; Zn, 80,000 mg; Fe, 90,000 mg; Cu, 15,000 mg; I, 1,600 mg; Se, 500 mg; Co, 600 mg

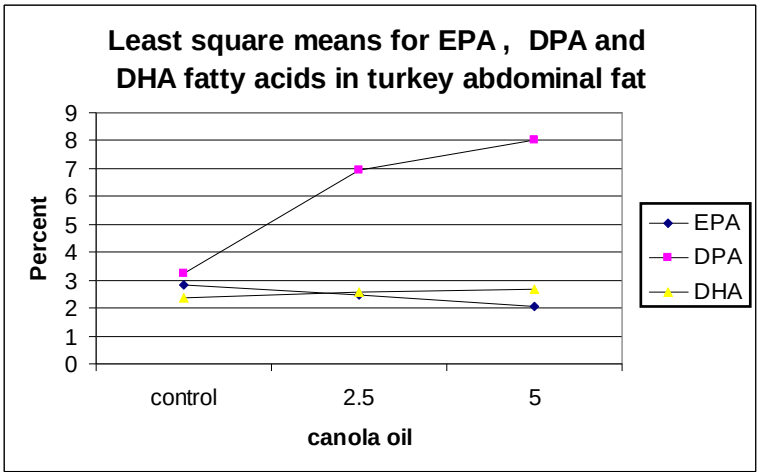

Figure 1. Least Square

Statistical Analysis

The performance and analytical data obtained were analyzed by variance analysis using the procedure described by the SAS version 8.2 [9]. The Duncan mean separation test was used to determine significant differences between mean values.

$$y_{ij} = \mu + a_i + \varepsilon_{ij}$$

Where

y_{ij} = all dependent variable

μ = overall mean

a_i = the fixed effect of oil levels($i = 1,2,3$)

ε_{ij} = the random effect of residual

3. Results and discussion

Results of fatty acids content was shown in table 2. Results show that canola oil could affect beneficial fatty acid content in the abdominal fat fatty acid. EPA content from 2.8226 percent in the control treatment reached to 2.4456 and 2.0535 percent in experimental treatments, respectively, but this change were not significant. DPA contents significantly increased in the treatment with usage canola oil and from 3.2516 percent in control group reached to 6.9323 and 8.0224 percent in experimental treatments and between treatment with 2.5 and 5 percent canola oil were have significant deference and 5 percent canola oil have good effect on the increased DPA content, but DHA content have not significant deference in treatments and partials increased in treatment and from 2.3414 percent in control group and reached to 2.5786 and 2.6517 percent. EPA and DHA are among the most biologically important fatty acids included in the human diet. A high EPA content would improve not only the meat but also the regulation of human lipid metabolism [10, 11]. However result show that usage of enrich vegetable oil such as canola oil could improve fatty acid profile of animal tissue and application animal product in human nutrition help to social health.

4. Conclusion

Usage canola oil could increase DPA content in abdominal fat and this status have beneficial effect on the abdominal fat tissue and this status help to human health.

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