Global Veterinaria 6 (3): 258-261, 2011
ISSN 1992-6197


# Modification of Ratio N-6 and N-3 Fatty Acids in the Abdominal Fat of Native Turkeys

*Ramin Salamatdoust Nobar, Abolfazl Ghorbani, K. Nazeradl,*
*Habib Aghdam Shahriyar and Saeid Ghaem Maghami*

Department of Animal Science,
Shabestar Branch, Islamic Azad University, Shabestar, Iran

**Abstract:** The purpose of this research was to evaluated canola oil effects on the Iranian male native turkey abdominal fat fatty acids composition. 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 showed that n- 6 fatty acids with ascending rate significantly increased compared to control group and n-3 fatty acids have same rate and increased compared to control group, this status affected this fatty acids ratios only numerically and n-6/n-3 or n-3/n-6 ratio with a partial change were not significant, Apparently due to same rate of n-3 and n-6 fatty acids the ratio not affected, but distribution of fatty acids of treatment were changed.

**Key words:** Native turkey · Abdominal fat · Fatty acids · Canola oil

## INTRODUCTION

Poly-unsaturated fatty acids (PUFA) and n-3 fatty acids in particular, have been shown to have positive effects on human health, the fatty acid composition of poultry abdominal fat is an important quality parameter, especially with respect to potentially affecting human health from poultry fat consumption. In this regard, n-3 group of poly-unsaturated fatty acids (PUFA) is one of the most important fatty acid (FA) groups [1, 2, 3]. Therefore, many studies are directed towards the manipulation of the FA composition of broiler chicks in order to increase n-3 PUFA content and decrease n-6/n-3 ratio in poultry meat [4]. Apart from the level of omega-3 in foods, the ratio of fatty acids especially Omega-6/omega-3 are also important from nutritional point of view [5]. Meat and meat products are the focal point in the diet of developed countries [6]. Meat is a major source of saturated fatty acids and conventional meat products have an n-6: n-3 ratio of higher than 15 [7]. Therefore, meat products could benefit from the addition of omega-3 PUFAs. The primary approach to enrich meat with omega-3 fatty acids is by incorporation of omega-3 sources such as flaxseed and or oil and fish meal and or oil in the diet of animals. This strategy has been reported by several researchers in pigs [8], lamb [9] and poultry [10]. Canola oil one of the source of n-3 fatty acids and proposse pf rhis research is this oil on the Iranian native turkeys abdominal fatty acids profile modification.

## MATERIALS AND METHODS

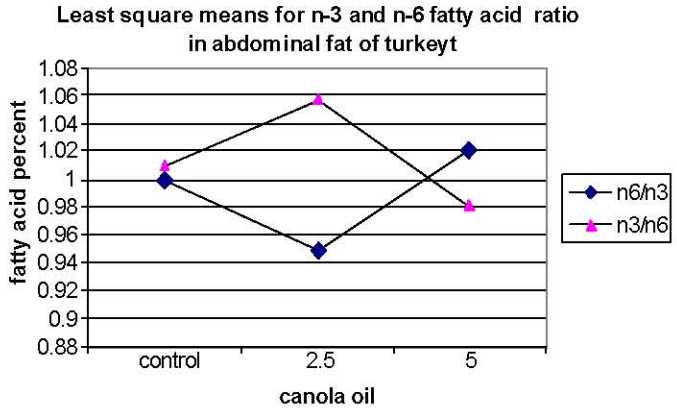
**Animals and Diets:** Ninety Iranian native turkey male chicks were divided into 3 groups of 30 chicks each. One group was fed a control diet and the other two with two different experimental diets enriched in omega-3 fatty acids (diet 1 containing 2.5% canola oil and diet 2 containing 5% canola oil 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.

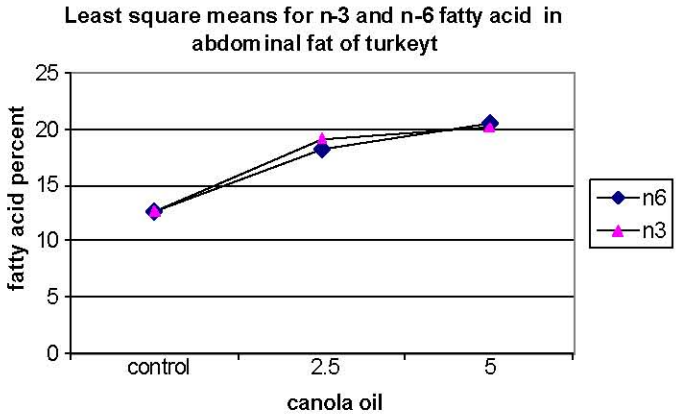
**Abdominal Fat Pad:** Abdominal fat pad (including fat surrounding gizzard, bursa of Fabricius, cloaca and adjacent muscles) was removed at 20 wk of age for turkeys. The abdominal fat was stored at -20°C until analysis. Fatty acid composition was determined by gas chromatography (GC).

**Corresponding Author:** Ramin Salamatdoust Nobar, Department of Animal Science, Shabestar Branch, Islamic Azad University, Shabestar, Iran, E-mail: r.salamatdoust@gmail.com.

Table 1: Least square means for fatty acid profiles in turkey abdominal fat

| | Treatments | | | | |
|---|---|---|---|---|---|
| SEM | P value | 5 | 2.5 | Control | |
| 0.2131 | 0.7390 | 1.3742 a | 1.4522 a | 1.2165 a | C14:0 |
| 0.2882 | 0.1375 | 0.3885 a | 0.5059 a | 1.2771 a | C15:0 |
| 0.4044 | 0.0001 | 17.4684 b | 18.7950 b | 28.4081 a | C16:0 |
| 0.2789 | 0.0083 | 10.7676 a | 9.3932 b | 8.9256 b | C18:0 |
| 0.3453 | 0.0001 | 10.3379 a | 8.5061 b | 4.1588 c | C18:2 n6 |
| 0.2600 | 0.0002 | 7.3953 a | 7.1479 a | 4.1790 b | C18:3 n-3 |
| 0.3160 | 0.0986 | 1.0091 b | 1.5371 ab | 2.1870 a | C20:0 |
| 0.5483 | 0.6334 | 2.0535 a | 2.4456 a | 2.8226 a | C20:5n-3 |
| 0.4247 | 0.8309 | 2.0112 a | 2.0410 a | 1.7060 a | C22:0 |
| 0.3927 | 0.0498 | 10.1304 a | 9.5746 ab | 8.3875 b | C22: 4n-6 |
| 0.2636 | 0.0001 | 8.0224 a | 6.9323 b | 3.2516 c | C22:5 n-3 |
| 0.3301 | 0.7924 | 2.6517 a | 2.5786 a | 2.3414 a | C22:6 n-3 |
| 0.6122 | 0.0003 | 20.4682 a | 18.0807 b | 12.5463 c | n6 |
| 0.9475 | 0.0027 | 20.1230 a | 19.104 a | 12.5950 b | n3 |
| 0.0499 | 0.5990 | 1.0218 a | 0.9492 a | 0.9997 a | n6/n3 |
| 0.0528 | 0.6145 | 0.9809 a | 1.0569 a | 1.0103 a | n3/n6 |




**Gas Chromatography of Fatty Acids Methyl Esters**

**Sample Preparation:** Total lipid was extracted from breast and thigh according to the method of Folch [11]. 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.

**Statistical Analysis:** The performance and analytical data obtained were analyzed by variance analysis using the procedure described by the SAS version 8.2 [12]. The Duncan mean separation test was used to determine significant differences between mean values.

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

Where as

$y_{ij}$ = All dependent variable
$\mu$ = Overall mean
$\alpha_i$ = the fixed effect of oil levels ($I$ + 1,2,3)
$\varepsilon_{ij}$ = the random effect of residual

## RESULTS AND DISCUSSION

Fatty acid composition are presented n the Table 2. According to results, saturated fatty acids include C14:0, C15:0 and C22:0 not effected in the experimental diets, but C16:0 and C18:0 content with usage canola oil significantly increased as compared with control group, but C20:0 with descending rate in the experimental treatment reduced compared control group. On the other hand n-6 fatty acids include C18:2 n-6 and C22:4 n-6 are affected by canola oil levels and with ascending rate in the treatments with 2.5 and 5 percent of oil significantly increased compared control group. N-3 fatty acid include C18: 3 n-3 and C22:5 n-3 contents have ascending rate in the experimental treatment as compared with the control group increased, but other determined fatty acids include C20:5 n-3 and C22:6 n-3 not changed in all of treatments. Total n- 6 fatty acids with ascending rate significantly increased as compared to control group and from 12.54 percent in the control group reached to 18.08 and 20.46 percent in the treatments, respectively and total of n-3 fatty acids have same rate and increased as compared to the control group and from 12.59 percent in the control group reached to 19.10 and 20.12 percent in the experimental treatments, this status affected this fatty acids ratios only numerically and n-6/n-3 or n-3/n-6 ratio with a partial change were not significant, Apparently due to same rate of n-3 and n-6 fatty acids the ratio not affected, but distribution of fatty acids of treatment changed. Between 2.5 and 5 percent of canola oil was not significant difference. The primary approach to enrich meat with omega-3 fatty acids is by incorporation of omega-3 sources such as flaxseed and or oil and fish meal and or oil in the diet of animals. This strategy has been reported by several researchers in pigs [8], lamb [9] and poultry [10]. How ever, increased of beneficial fatty acids in animal product could affect human health and increase quality of carcass.

In Conclusion regard of the production potential of native turkey's usage of canola oil in the diets could incorporate n-3 fatty acids to tissues and improved ratio of fatty acids.

## REFERENCES


1. De Lorgeril, M., S. Renaud, N. Mamelle, P. Salen, J.L. Martin, I. Monjaud, J. Guidollet, P. Touboul and J. Delaye, 1994. Mediterranean Alpha-linolenic Acid-rich Diet in Secondary Prevention of Coronary Heart Disease. Lancet, 343: 1454-1459.
2. Hartman, I.S., 1995. Alpha-linolenic Acid: A Preventive in Secondary Coronary Vents? Nutr. Rev., 55(7): 94-201.
3. Leaf, A. and J.X. Kang, 1998. N- 3 Fatty Acids and Cardiovascular Disease. World Rev. Nutr. Diet., 83: 24-37.
4. Calder, P.C., 2001. Polyunsaturated Fatty Acid, Inflammation and Immunity. Lipids, 36: 1007-1024.
5. Simopoulos, A. P., 2008. The importance of the omega-6/omega-3 fatty acid ratio in cardiovascular disease and other chronic diseases. Exp. Biol. Med., 233: 674-688.
6. Fernández-Ginés, J.M., J. Fernández-López, E. Sayas-Barberá and J.A. Pérez-Alvarez, 2005. Meat products as functional foods: A review. J. Food Sci., 70: 37-43.
7. Reglero, G., P. Frial, A. Cifuentes, M.R. García-Risco, L. Jaime, F.R. Marin, V. Palanca, A. Ruiz-Rodríguez, S. Santoyo and F.J. Señoráns, 2008. Meat-based functional foods for dietary equilibrium omega-6/omega-3. Mol. Nutr. Food Res, 52: 1153-1161.

8. Nuernberg, K., K. Fischer, G. Nuernberg, U. Kuechenmeister, D. Klosowska, G. Eliminowska-Wenda, I. Fiedler and K. Ender, 2005. Effects of dietary olive oil and linseed oil on lipid composition, meat quality, sensory characteristics and muscle structure in pigs. Meat Sci., 70: 63-74.
9. Elmore, J.S., S.L. Cooper, M. Enser, D.S. Mottrama, L.A. Sinclair, R.J. Wilkinson and J.D. Wood, 2005. Dietary manipulation of fatty acid composition in lamb meat and its effect on the volatile aroma compounds of grilled lamb. Meat Sci., 69: 233-242.
10. Komprda, T., J. Zelenka, E. Fajmonova, M. Fialova and D. Kladrobas, 2005. Arachidonic Acid and longchain n- 3 polyunsaturated fatty acid contents in meat of selected poultry and fish species in relation to dietary fat sources. J. Agric. Food Chem., 53: 6804-6812.
11. Folch, J., Lees, M. and G.H. Sloane-Stanley, 1957. A simple method for the isolation and purification of total lipids from animal tissues, J. Biol. Chem., 226: 497-509.
12. SAS SAS Institute, 2003. SAS User's Guide: Statistics. Version 5 Edition. SAS Institute, Inc., Cary, NC.