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Dietary Effect of Iranian Native Turkey Breast Meat Saturated Fatty Acids

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Abstract: This experiment was conducted to determine the effect of dietary Canola oil (unsaturated oil) of on breast meat Saturated Fatty Acids (SFA) percentage. Ninety male Iranian native turkey were randomly distributed into three experimental treatments to determine of the amount canola oil fatty acids deposited in raw chicken tissues. These diets were isonitrogenous and isoenergetic were given to broiler chickens throughout a 20 wk growth period. Meat fatty acids profiles with Gas Chromatography (GC) technique were measured. Data was analyzed with one way ANOVA and means compared with Duncan test. According to results Saturated fatty acids for breast meat significantly ($p<0.05$) from 40.7854% reached to 32.977 and 32.642% for experimental treatment and this status increased unsaturated fatty acid content.

Key words: Breast, Canola oil, native, Turkey, saturated fatty acid

INTRODUCTION

In the last years, turkey meat consumption is growing as is the amounts of people who are aware of turkey's low cost and low fat compared to red meat and are making it a part of their regular diet. Turkey is one of the leanest types of poultry because of the low fat (10%), and a good source of protein and minerals (Castro Ferreira *et al*., 2000). It is also known that consumers should reduce total dietary fat intake because fat rich in saturated fatty acids causes an increase in the concentration of plasma Low Density Lipoprotein (LDL) in humans, which is correlated with increased risk of coronary heart diseases. Therefore, as health organizations all over the world promote the strategy that the intake of saturated fatty acids and cholesterol should be limited in order to reduce the risk of heart diseases (AHA, 1986; NCEP, 1988). Unsaturated fatty acids in the diet have been shown to decrease plasma LDL cholesterol in blood. However Polyunsaturated Fatty Acids (PUFA) reduce High Density Lipoprotein (HDL) cholesterol levels while lowering LDL cholesterol. On the other, hand increasing Monounsaturated Fatty Acid contents (MUFA) in the diet does not decrease the plasma HDL-cholesterol level while lowering LDL cholesterol in plasma (Mattson and Grundy, 1985). The oleic and linoleic acids raise the HDL and lower the LDL cholesterol (Katan *et al*., 1994). For these reasons, nutritionists generally recommend a change in composition of the fat associated with meat products by substituting MUFA for saturated fatty acids (Zanardi *et al*., 2000). Objective of this study was to evaluate canola oil effects on the Iranian turkey breast meat saturated fatty acids content.

MATERIALS AND METHODS

Animals and diets: The investigation was performed on 90 male native Iranian turkeys in their fattening period (from 4th to 20th week of age) in east Azerbaijan research center for agriculture and natural resources. The turkey chicks with completely randomized design of 3 treatments, with 3 repetitions and 10 chicks in each box were fed experimental diets containing 0% CO(T1) , 2.5% CO(T2) and 5% CO(T3) in the fattening period. The experimental diets formulated isonitrogenouse and isoenergetic, accordance with the 1994 recommendations of the National Research Council (Table 1). The birds were given access to water and diets ad-libitum. The composition and calculated nutrient composition of the treatment diet is shown in Table 1. At the end of the growing period the number of two pieces from each pen randomly selected and in order to reduce variation in the cutting procedure, all dissections were carried out by one operator. After weighing the eviscerated carcass, it was

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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

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

apportioned into commercial cuts as back, two leg-thigh, two wings and breast (Hudspeth *et al*., 1973; Orr *et al*., 1984). Breast was obtained after removing wings by cutting through the shoulder joint at the proximal end of humerus and by cutting through the ribs, thereby separating the breast from the back (excluding skin). Breast meat sample separated and frozen at -20ºC until to determine as fatty acids profile.

Gas chromatography of fatty acids methyl esters:
Sample preparation:
Fatty acids: Total lipid was extracted from breast and thigh according to the method of Folch *et al*. (1957). 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: Data were analyzed in a complete randomized design using the GLM procedure of SAS version 12 (SAS Inst. Inc., Cary, NC).

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

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
Duncan multiple range test used to compare means.

RESULTS AND DISCUSSION

Table 2 lists the fatty acid composition of breast meat of turkeys. Results show that usage of canola oil in diet of turkey chicks could influence numerically content of C14:0, C15:0, C20:0 fatty acids, but C18:0 content significantly from 8.97% in the control group reached to 9.26 and 10.75% and for C22:0 has ascending rate and significantly from 0.9326% in the control group reached to 2.0205 and 2.6262%. Application of canola oil significantly changed C16:0 fatty acid and from 28.59% in control; group reached to 19.30 and 16.94% in the experimental group, respectively. Unsaturated oil in the turkey nutrition has high affect on the C16:0 and this status significantly affected on the total saturated fatty acids and from 40.7854% in the control group reached to 32.977 and 32.642% in the experimental group. This

Table 2: Least square means for fatty acid profiles in turkey breast

	Treatments				
	T1	T2	T3	SEM	P>F
C14:0	0.7424[a]	0.8457[a]	1.0254[a]	0.2436	0.1068
C15:0	0.2114[a]	0.2562[a]	0.2917[a]	0.8880	0.1158
C16:0	28.590[a]	19.30[b]	16.94[c]	0.0001	0.4042
C16:1 n7	7.11[a]	5.95[b]	4.83[c]	0.0001	0.1427
C18:0	8.97[b]	9.26[b]	10.75[a]	0.0016	0.2000
C18:1 n9	17.43[a]	15.60[b]	15.30[b]	0.0134	0.3725
C18:1 Trans t11	0.2987[a]	0.2077[a]	0.4518[a]	0.5209	0.1447
C18:2	2.5059[a]	2.8915[a]	3.1760[a]	0.2014	0.2314
C18:2 Trans t12	0.5293[a]	0.3253[a]	0.5655[a]	0.7134	0.2168
C18:2n6Cis	4.4154[c]	8.2898[b]	9.3383[a]	0.0001	0.2439
C18:3 n-3	3.5562[c]	6.7994[b]	8.2447[a]	0.0001	0.1993
C20:0	1.3194[a]	1.2867[a]	1.2688[a]	0.9898	0.2536
C20:5n-3	1.3421[b]	2.3737[a]	2.1263[a]	0.0390	0.2230
C20:1n-9	0.6001[b]	1.3501[a]	1.6164[a]	0.0141	0.1718
C22:0	0.9326[b]	2.0205[a]	2.6262[a]	0.0054	0.2291
C22: 4n-6	8.8864[a]	10.1375[a]	10.6384[a]	0.1111	0.5019
C22:5 n-3	2.7250[c]	6.7263[b]	8.3857[a]	0.0002	0.4243
C22:6 n-3	1.9138[a]	2.5467[a]	2.4275[a]	0.2282	0.2436
STUfa	40.7854[a]	32.977[b]	32.642[b]	0.0001	0.6144
unsatu fa	50.4460[b]	62.130[a]	66.164[a]	0.0006	1.4412

Different superscripts in each raw indicate significant difference

change of saturated fatty acids related with unsaturated fatty acids contents and significantly increased and reached to 62.130 and 66.164% in the experimental group. The decrease in total saturated fatty acids contents were due primarily to the decrease in palmitic fatty acid, because stearic acid is considered much less hypercholestrolemic, or not hypercholeterolmic compared to palmitic fatty acid (Bonanome and Grundy, 1988; Katan *et al*., 1995; Grundy, 1997), addition of canola oil to the diet was clearly beneficial. Dietary saturated fatty acids are an independent risk factor associated with coronary heart disease; their negative effects on low density lipoprotein cholesterol (AHA, 1988; Hornstra *et al*., 1998). The reduce of saturated fatty acid could indicate a strong health advantage of breast meat.

CONCLUSION

Results show that Saturated fatty acids of breast meat, significantly reduced ($p<0.05$) and from 40.7854% reached to 32.977 and 32.642% for experimental treatments and this status increased unsaturated fatty acid content.

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