# Dietary supplementation with polyunsaturated fatty acids source and its effects on the native turkey's liver important beneficial fatty acids

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**Abstract:**This experiment was conducted to evaluated canola oil on the some of beneficial fatty acids of Iranian native turkey liver. Nine male turkey chicks randomly divided into three experimental treatments (Three levels of canola oil; 0, 2.5 and 5 percent) with three replicates were arranged in a completely randomized design. Experimental diets consisted of: Basal diet with 0, 2.5 and 5 percent of canola oil. adrenic acid, docosapentaenoic acid and α-linolenic acid significantly affect canola oil and this status show that canola oil could improved liver fatty acids profile.

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## 1. Introduction

Essential fatty acids such as omega-3 fatty acids are molecules that cannot be synthesized by the human body but are vital for normal metabolism. Deposition of EPA and DHA in animal products such as meat and eggs provides a valuable source in the human diet. Feeding the long chain n-3 fatty acids EPA and DHA leads to their deposition in intramuscular fat and in eggs, particularly as phospholipids. There is some production by the animal of EPA and DHA from 18 carbon n-3 fatty acids (linolenic synthesis) which occurs in some vegetable oils such as canola seed or oil and linseed(flax). We know chicken meat due to relatively low prices could play an important role in human diets. The poultry has a peculiar capability of incorporating omega -3 fatty acids in the internal fat of meat and other tissues (Saricicek et al., 1997, Crespo and Esteve-Garcia, 2001, Zollitsch et al., 1997 and Osek et al., 2001). Due to increased knowledge of people, consumers have become health conscious and want to consume only healthy foods. Therefore in many countries manufacturers have started producing health-promoting foods. However, animal tissues enriched with n-3 fatty acids could effectively help to human health (Kinsella et al., 1990). Canola oil is marketed as oil very low in saturated fatty acids and high in monounsaturated fatty acids, and one of good source of omega 3 fatty acids (Mehta, 2000[a,b]), and could directly usage in human foods or indirectly meets from enriched animal tissue such as meat or giblet. Poultry liver prices is low and poor people application that for food cooking. Iranian native turkey keeping in the north of Azerbaijan village as range breeding, in this experiment deference level of canola oil usage in native turkey's diets and their effects on the liver fatty acids profile were studied.

## 2. Materials and methods

Nine male native turkey chickens were distributed in a completely randomized design (three level of canola oil 0, 2.5, 5 percent) with three experimental units each (ten chicks/pen).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 slaughtered with cutting the neck vessels and experimental samples from each liver tissue samples prepared and sent to the laboratory at temperature -20$^{\circ}$C below zero were stored and the composition of fatty acids present in the samples (Table 2) was determined by gas liquid chromatography, according to Folch et al (1957).

### Statistical Analysis

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

## 3. Results

Least square means for EPA and DHA fatty acids of turkey liver shown in table 2. Eicosapentaenoic acid (EPA) or (5, 8, 11, 14, 17-eicosapentaenoic acid) not significant and experimental treatment numerically decreased compared control group. Docosahexaenoic acid (DHA) or (4, 7, 10, 13, 16, 19-docosahexaenoic acid) contents have a same rate and between different treatment have not significant deferent. C22: 4n-6, adrenic acid or ( 7,10,13,16-docosatetraenoic acid) Control group with 7.7425 percent and treatment with 2.5 percent canola oil with 8.0057 percent not significant, but experiment with percent canola oil with 9.9028 percent compared other group significantly is higher. C22:5 n-3, docosapentaenoic acid (DPA) or (7,10,13,16,19-docosapentaenoic acid) significantly affected levels of canola oil and from 3.3204 percent in control group respectively reached to 7.2176 and 8.0682 percent for 2,5 and percent of canola oil. C18:3 n-3, α-linolenic acid or (9,12,15-octadecatrienoic acid) in control group is 4.2234 percent ad usage canola oil in experimental treatment significantly increased content this fatty acid and respectively reached to 7.5523 and 7.9896 percent. DPA and DHA are chemically derived from linolenic acid; the conversion of linolenic acid into these products is not very efficient in mammals. The direct addition of these longer chain omega-3 fatty acids to the diet can significantly increase the amounts of EPA, DPA, and DHA in the tissues (Leskanich et al., 1997, Wood and Enser, 1997). Dietary fatty acids to modify tissue fatty acids profile (Azain, 2004). The fatty acid concentrations in meat, adipose and tissues reflect the animal's own metabolic processes as well as the diet it has consumed. Previous work has shown how the type of oil or fat consumed by animals can change the fatty acid concentrations in body tissues proportionately to the concentrations found in the diet (Skelley et al., 1975, Busboom et al., 1991, Romans et al., 1995, and Bee et al., 2002). This result suggests that the animals were able to process and incorporate the PUFAs into body tissues.

Table 2: Least square means for EPA and DHA fatty acids of turkey liver

| | Canola oil levels | | | | |
|---|---|---|---|---|---|
| | control | 2.5 | 5 | P value | SEM |
| **C20:5n-3** [1] | 2.842 [a] | 2.321 [a] | 2.500 [a] | 0.8729 | 0.7111 |
| **C22:6 n-3** [2] | 3.030 [a] | 2.637 [a] | 3.425 [a] | 0.4450 | 0.4089 |
| **C22: 4n-6** [3] | 7.7425 [b] | 8.0057 [b] | 9.0928 [a] | 0.0290 | 0.2756 |
| **C22:5 n-3** [4] | 3.3204 [b] | 7.2176 [a] | 8.0682 [a] | 0.0004 | 0.4136 |
| **C18:3 n-3** [5] | 4.2234 [b] | 7.5523 [a] | 7.9896 [a] | 0.0008 | 0.3843 |

1- eicosapentaenoic acid (EPA) or ( 5,8,11,14,17-eicosapentaenoic acid) 2- docosahexaenoic acid (DHA) or ( 4,7,10,13,16,19-docosahexaenoic acid) 3- adrenic acid or ( 7,10,13,16-docosatetraenoic acid) 4- docosapentaenoic acid (DPA) or (7,10,13,16,19-docosapentaenoic acid) 5- α-linolenic acid or (9,12,15-octadecatrienoic acid)

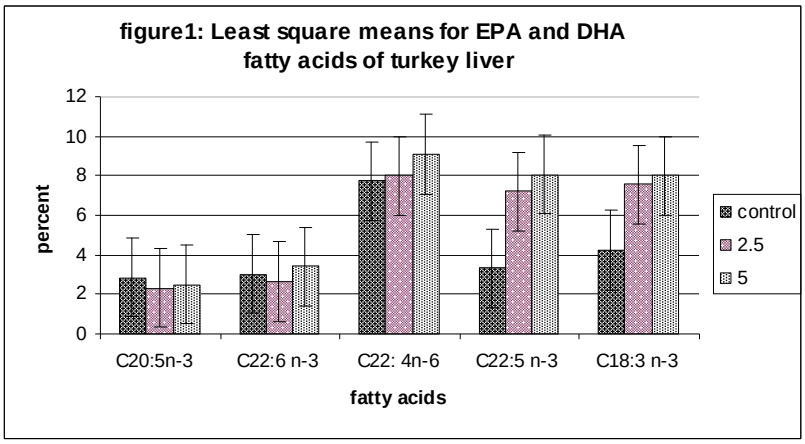

TABLE 1. Percentage composition of experimental diets in four period

| | 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

**Conclusion**

In conclusion, this study has demonstrated that the use of canola oil could significantly increased adrenic acid, docosapentaenoic acid and α-linolenic acid content in the liver of native Iranian turkey and improved that quality.

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