INFLUENCE OF VEGETABLE OIL ON FATTY ACID PROFILE OF CHICKEN MEAT

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Introduction

Consumption of chicken meat is constantly growing. Consumers' prefer meat that is tasty and beneficial to their health. Feeding of chickens with diets rich in unsaturated fatty acids alters the ratio of saturated (SFA) and unsaturated (MUFA and PUFA) acids in meat. Recently, consumers pay more attention to the PUFA n-3 and the PUFA n-6/PUFA n-3 ratio in their diets. Dietary composition can affect the nutritive quality of poultry meat, which enables designing of fatty acid profiles in the lipids of muscular tissue (Kralik and Canecki, 2003). Medical researches have raised the issue of fat consummation and of fat composition. Supplementation of vegetable oils can affect the alteration of fatty acid profile in lipids of chicken meat (Lopez-Ferrer et al., 1999, Kralik et al., 2001, Valavan et al., 2006). Ajuyah et al. (1991) stated that dietary supplementation of full-fat linseed and rapeseed can enrich chicken meat with α LNA, EPA and DHA, and lower the content of total fat. Similar results are stated by Crespo and Esteve-Garcia (2001). This paper elaborates the effect of dietary supplementation of sunflower, rapeseed and linseed oils on the profile of fatty acids in breast muscle lipids.

Materials and Methods

Fattening of the Ross 308 chickens lasted for 42 days. Chickens were divided into three groups. From the 1st to 21st day, chickens were fed starter diets that contained 22% of protein and 12.64 MJ/kg ME. From the 22nd to 42nd day feeding was continued with finisher diets that contained 20% of protein and 13.5 MJ/kg ME. The 1st group was given diets supplemented with 5% of sunflower oil, the 2nd group had diets with 5% of rapeseed oil, and the 3rd one was fed diets containing 5% of linseed oil. Upon slaughtering, samples of breast muscles were taken for analysis (6 samples from each group). Content of fatty acids in the lipids of breast muscles was determined by the Chrompack CP-9000 chromatograph equipped with flame ionization detector (Csapo et al., 1986). Portions of SFA and MUFA, as well as PUFA n-6 and PUFA n-3 were shown as a percentage of a total fatty acid content in lipids of breast muscles. Differences among investigated groups were determined by the t-test in the Statistica 7.1. computer software (StatSoft.Inc. 1984-2005).

Results and Discussion

Lipids of breast muscles of chickens fed diets with 5% of sunflower oil (1st group) contained statistically significantly higher ($P<0.001$) portion of SFA than the 2nd group fed with 5% of rapeseed oil and the 3rd group fed with 5% of linseed oil.

Content of MUFA in breast muscle lipids of the 2nd group was statistically significantly higher ($P<0.001$), if compared to the 3rd and 1st group (30.41% : 23.11% : 19.69%, respectively). Breast muscle lipids of the 1st group had higher content of PUFA n-6 and LA than the 2nd and 3rd group, however, these differences were not statistically significant ($P>0.05$). Analysis of the PUFA n-3 content in breast muscle lipids showed that feeding of chickens with diets supplemented with 5% of linseed oil (3rd group) resulted in statistically significantly higher ($P<0.001$) content of α LNA, EPA and DHA. Consequently, total content of PUFA n-3 was more favorable in breasts of the 3rd group than of the 1st and 2nd group. Kralik and Canecki (2003) stated slightly higher values of EPA and DHA in lipids of breast muscles of chickens fed with rapeseed oil. Similar portions of PUFA n-3 were reported by Lopez-Ferrer et al. (1999) and Valavan et al. (2006) in their researches into dietary supplementation with linseed oil. Our conclusion that higher content of α LNA affects better deposition of EPA and DHA in muscle lipids is in accordance with research results reported by Ajuyah et al. (1991), as well as of Chanmugam et al. (1992).

Figure 1 presents the ratio of total PUFA n-6/PUFA n-3. This ratio is the most favorable for the 3rd group (2.47), than for the 2nd group (6.52), and lastly for the 1st one (10.87). Okuyama and Ikemoto (1999) recommended the ratio of PUFA be as close as 1.

Conclusions

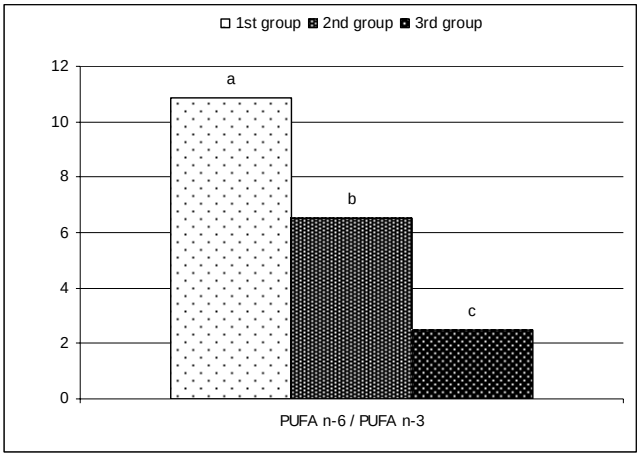
Based on the completed research into the vegetable oil supplementation to chickens' diets (5% of sunflower oil in diets of the 1st group, 5% of rapeseed oil in diets of the 2nd group and 5% of linseed oil in diets of the 3rd group) and its effect on the profile of fatty acids in breast muscle lipids, it can be concluded that the 1st group had statistically significantly higher ($P<0.001$) content of SFA and PUFA n-6, and the 2nd group had higher content of MUFA. In comparison with the 1st and 2nd group, statistically significantly higher ($P<0.001$)

content of PUFA n-3 (with the highest portion of α LNA) was determined in breast muscle lipids of the 3rd group. The ratio of PUFA n-6/PUFA n-3 in breast muscle lipids was statistically significantly lower (P<0.001) in chickens fed diets supplemented with linseed oil (2.47) than in chickens fed diets with supplemented rapeseed oil and sunflower oil (6.52 : 10.87, respectively).

Table 1. Fatty acid content in fatty tissue of breast muscles (% of total fatty acids)

Fatty acid	1st group	2nd group	3rd group
SFA	33.93±4.36[a]	27.33±3.12[b]	29.35±2.91[ab]
MUFA	19.69±3.66[b]	30.41±1.66[a]	23.11±2.67[b]
18:2 n-6	28.80±5.12	27.74±3.21	25.30±1.89
18:3 n-6	0.17±0.06	0.16±0.03	0.14±0.02
20:2 n-6	1.60±0.39[a]	0.77±0.17[b]	0.93±0.11[b]
20:3 n-6	1.14±0.17[a]	0.74±0.23[b]	0.97±0.19[ab]
20:4 n-6	4.83±1.17	4.18±1.03	4.80±1.09
S PUFA n-6	36.54±3.60	33.59±3.03	32.14±1.41
18:3n-3	1.56±0.44[c]	3.12±0.58[b]	7.58±1.24[a]
20:5n-3	0.10±0.06[b]	0.20±0.06[b]	0.85±0.30[a]
22:5n-3	0.83±0.29[b]	0.97±0.21[b]	2.80±0.87[a]
22:6n-3	0.87±0.24[b]	0.86±0.20[b]	1.78±0.48[a]
S PUFA n-3	3.36±0.26[c]	5.15±0.55[b]	13.01±1.19[a]

[a-c] Means in the same row marked with the same letter do not differ significantly at the 0.001 level of significance



a, b, c P<0.001

Figure 1. Ratio of PUFA n-6 / PUFA n-3

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