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Effect of the nutritive value of dietary fats in relation to their chemical composition on fatty acid profiles of abdominal and skin fat in finishing chickens

Einfluß des Nährwertes von Futterfetten in Abhängigkeit von der chemischen Zusammensetzung auf das Fettsäuremuster im Abdominal- und Hautfett von Masthühnern

A. Blanch, A.C. Barroeta*, M. C. Baucells and F. Puchal

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Introduction

Numerous studies have been undertaken to investigate changes in the utilisation of dietary fat by chickens with the chemical structure of the fat as a further independent variable. It has been argued that an improvement in the utilization with age is expected, the increase being more evident with a higher level of saturated fat (Fedde et al., 1960). Thus, Carew et al. (1972) indicated that the physiological capacity for fat utilization is not well establised in young birds but that it increases with age. More recently, Wiseman and Salvador (1989) evaluated tallow and vegetable oil at different rates in a basal diet fed to birds aged 1.5, 5.5, and 7.5 weeks of age and pointed out a marked increase in the apparent metabolizable energy (AME) of fats from 1.5 to 3.5 weeks of age with a less pronounced effect thereafter.

The influence of dietary fat supplementation on the fatty acid composition of carcass fat of birds is well established, with body fat reflecting the fatty acid composition of dietary fat in chicks (Lipstein et al., 1970; Bartov et al., 1974; Hulan et al., 1984; Olomu and Baracos, 1991), although there is less information on these relationship among different tissues.

There is concern relating to the fatty acid profile of carcass fat. Increased degrees of unsaturation have been identified as positive features of carcass fat with respect to human health, but may in fact have a negative effect upon shelf-life and organoleptic characteristics of poultry meat (Wiseman, 1988).

The following trial was conducted to compare the nutritive value of different commercial fats included at 60 g/kg level in a finisher diet for broiler chicks aged 35 days of life and to evaluate the effect of different features such as addition of soybean lecithin into tallow, free fatty acid content and blends of fats and degree of saturation, on this nutritive value. Besides, the effect of feeding these ingredients on the fatty acid profile of abdominal and skin fat at the slaughter age of 42 days was studied.

* Corresponding author: Unitat Docent de Nutrició i Alimentació Animals, Facultat de Veterinària, Universitat Autònoma de Barcelona, Bellaterra, Catalonia, Spain
Tel. number: 34-3-581.18.97; Fax number: 34-3-581.20.06

Materials and methods

Seven fats were selected for evaluation: palm oil (PO); tallow (T1 and T2); tallow + soybean oil (50:50, TSO); tallow + soybean acid oil (50:50, TSAO); soybean oil (SO) and linseed oil (LO). All of them, with the exception of T1, contained 5% of Soybean Lecithin. Their fatty acid composition is given in Table 1. They were carefully included in a basal diet (Table 2) at a level of 60 g/kg. The

Table 1. Analyses of added fats and fatty acid composition (g/kg of total fatty acids)[1]
Analysenwerte und Fettsäuremuster (g/kg Gesamtfettsäuren) der zugesetzten Fette

Added fats[2]	H_2O	IMP	UNS	GE	FFA	U:S	$C_{14:0}$[3]	$C_{16:0}$	$C_{16:1}$	$C_{18:0}$	$C_{18:1}$	$C_{18:2}$	$C_{18:3}$
	MJ/kg												
PO	0.8	0.4	2.7	38.9	52.6	10.1	9.6	443.6	1.4	43.7	366.8	126.7	51.0
T1	1.1	4.0	4.5	38.9	38.8	1.16	28.0	250.1	24.0	188.6	464.0	41.8	9.2
T2	1.8	4.9	4.6	38.7	42.9	12.2	26.8	243.9	23.3	179.0	457.0	65.2	4.7
TSO	1.1	3.4	5.6	38.6	25.6	25.3	12.6	166.2	9.3	104.2	348.2	341.0	18.5
TSAO	4.0	3.5	0.3	39.0	342.0	22.2	13.9	177.0	9.2	110.1	340.9	312.8	6.1
SO	1.1	1.8	5.0	39.1	8.6	67.9	0.0	7.2	0.0	41.2	244.6	594.3	32.7
LO	0.7	3.4	7.5	38.8	32.4	74.6	0.0	65.7	0.0	52.5	209.2	178.8	493.8

[1] H_2O = moisture; IMP = impurities; UNS = unsaponifiable; GE = gross energy; FFA = free fatty acid content; U:S = unsaturated-saturated fatty acid ratio.
[2] PO = palm oil; T1 = tallow; T2 = tallow + 5 g/kg soybean lecithin; TSO = tallow + soybean oil (50:50); TSAO = tallow + soybean acid oil (50:50); SO = soybean oil; LO = linseed oil.
[3] Carbon chain length followed by number of double bonds.

Table 2. Composition of basal diet
Zusammensetzung der Basisration

Ingredients and analyses	g/kg
Maize	373.2
Wheat	257.9
Soya meal (48% protein)	331.9
Calcium carbonate	8.0
Dicalcium phosphate	20.5
DL-methionine	0.8
Salt	2.5
Micromix[1]	5.2
Total	1000.0
Calculated analysis	
Metabolisable energy, MJ/kg	11.9
Total lipids	27.0
Crude protein	206.0
Lysine	10.4
Methionine + cystine	7.7
Calcium	8.0
Total phosphorus	7.4

[1] Supplied per Kilogram of diet: vitamin A, 12,000 IU (β-carotene); cholecalciferol, 3,000 ICU; vitamin E, 30.0 IU (dl-α-tocopherol); vitamin K_3, 3.0 mg; thiamine, 2.2 mg; riboflavin, 8.0 mg; pyridoxine, 5.0 mg; vitamin B_{12}, 0.01 mg; folic acid, 1.5 mg; biotine, 0.15 mg; calcium pantothenate, 25.0 mg; niacine, 65.0 mg; ethoxyquin, 150 mg; iron, 80 mg; copper, 8 mg; zinc, 40 mg; manganese, 60 mg; selenium, 0.15 mg; iodine, 0.33 mg.

experimental diets (a basal diet and seven fat-supplemented diets) were fed to 96 chicks, allocated in individual cages, from the 21st day of age. Feed and water were provided ad libitum. The 96 metabolism cages (12 replicates per experimental diet) were randomly positioned in a room mantained at conditions appropiate for the birds (20 °C; 23 h of light). The balance period was undertaken between days 35 and 39 of age. Chickens were subjected to 17 h of feed deprivation before and after the experimental period. Total collection of excreta was taken daily and frozen (−20 °C) for 4 consecutive d. At the end of the balance collection period feed intakes were recorded and excreta output for each cage was lyophilized, weighed, and ground through a laboratory mill fitted with a 1-mm screen.

Fat content of diets and excreta was analysed using the method of FOLCH et al. (1957) by extraction with chloroform-methanol (2.1 vol/vol) following acidification with 6 N HCl. These procedures allowed the calculation of apparent fat availability (AFA) of the experimental diets. Corresponding values for added fats were determined by the difference between the value obtained for the basal diet and those obtained for the fat-supplemented diets. The utilisation of fat in the basal diet was assumed to be constant. Fatty acid composition of the lipid extracts obtained from diets and excreta was determined by gas chromatography using margaric acid (C17:0) as an internal marker. The lipid extracts were esterified using sodium methylate (0.5 N) and boron trifluoride-methanol complex (20%). The resultant fatty acid methyl esters were separated and quantified by gas chromatography (Shimadzu GC-14A) equipped with a flame ionization detector, fused silica capillary column (Supelco, A Rohm and Haas Company, 30 m × 0.25 mm internal diameter, 0.20 μ film thickness) and integrator (Shimadzu C-R6 A). Helium was used as carrier gas at a flow rate of 2 mL/min. The column temperature was 150 °C for 3 min and increased to 206 °C at a rate of 7 °C/min in order to separate fatty acids from 14 to 18 carbons in chain length. The identification of the different fatty acids was carried out by comparison with retention times of known pure fatty acids standards purchased from Sigma-Aldrich Química S.A. Thus, the apparent availability of each fatty acid (AAFA) for palmitic (C16:0), stearic (C18:0), oleic (C18:1), linoleic (C18:2), and linolenic (C18:3) acids from the experimental diets were calculated. All experimental diets, fats and excreta were analyzed for gross energy using a Parr adiabatic bomb calorimeter. The AME values of experimental diets were estimated with reference to gross energy consumed and gross energy voided. The AME values of added fats were obtained from the product of their AFA and their gross energy. At the end of a six week feeding period, eight birds from each dietary treatment were taken, weighed, killed by exanguination and defeathered in a commercial processing plant. They were stored under refrigeration for 24 h before their evisceration. The abdominal fat pad of each animal, considered as the fat extending within the ischiumn surrounding the cloaca, and adjacent to the abdominal muscle, was removed and weighed. Carcass weights were also recorded before removing breast skin and abdominal fat samples. All samples were stored at −20 °C for latter analyses. The total lipid extraction from the tissues samples and the fatty acid composition of the lipid extracts obtained were carried out following the same procedures used for diets and excreta analyses.

Results from AME, AFA, and AAFA of experimental diets and supplemented fats, and data relating to fatty acid profile of abdominal and skin fat were subjected to one way analyses of variance and means comparison was made by Student-Newman-Keuls tests. The SAS® program (SAS Institute, 1992) was used for statistical analysis.

Results and discussion

Table 3 shows AFA and AME results obtained for the experimental diets and added fats. As it could be expected, the AME value for the basal diet without added fat was significantly lower than for the fat-supplemented diets, because of the lower gross energy content of the former. These results revealed that, with the exception of TSAO

Table 3. Apparent fat availability (AFA) and apparent metabolizable energy (AME) of experimetal diets and added fats
Scheinbare Fettverfügbarkeit (AFA) und scheinbare umsetzbare Energie (AME) der Versuchsrationen und der zugesetzten Fette

Dietary treatments[1]	Experimental diets		Added fats	
	AFA (g/kg)	AME (MJ/kg)	AFA (g/kg)	AME (MJ/kg)
Basal diet	519.0^{D}	11.9^{C}	...	...
Basal diet + PO	778.6^{BC}	13.3^{A}	890.2^{BC}	34.6^{BC}
Basal diet + T1	722.1^{C}	12.9^{AB}	809.3^{C}	31.5^{C}
Basal diet + T2	754.4^{BC}	13.1^{AB}	855.6^{BC}	33.1^{BC}
Basal diet + TSO	825.6^{AB}	13.1^{AB}	957.4^{AB}	37.3^{AB}
Basal diet + TSAO	716.8^{C}	12.4^{BC}	801.8^{C}	30.9^{C}
Basal diet + SO	831.7^{AB}	13.2^{A}	966.1^{AB}	37.8^{AB}
Basal diet + LO	888.4^{A}	13.2^{A}	1047.3^{A}	40.7^{A}
Standard Error	20.6	0.004	30.1	0.003

[A–D] Means in the same column with no common superscript differ significantly ($P < 0.01$).
[1] Added fats (60 g/kg into basal diet): PO = palm oil, T1 = tallow without soybean lecithin, T2 = tallow with 50 g/kg added soybean lecithin, TSO = tallow + soybean oil (50:50), TSAO = tallow + soybean acid oil (50:50), SO = soybean oil, LO = linseed oil.

diet, there was no significant difference in AME among fat supplemented diets, although there were significant differences in the utilisation of the different added fats. This lack of differences between AME of six supplemented diets may represent the effects of fat on the utilisation of energy from other dietary constituents. It is well-established that fats and other ingredients are not additive with respect to energy utilization in poultry (MATEOS and SELL, 1980, 1981).

Addition of soybean lecithin into tallow

The effect of addition of soybean lecithin into tallow is evaluated by means of data relating to diets with T1 (without soybean lecithin) and T2 (with soybean lecithin). Table 3 shows the AFA and AME values obtained for T1 and T2 treatments (diets and added fats). The inclusion of soybean lecithin into tallow did not improve significantly the AFA and AME values for experimental diet and added fat. These results are at variance with the increase in the metabolizable energy results of added fat, parallel to lipid availability, after a higher lecithin supplementation (12.5 g/kg of basal diet), observed by SIBBALD and KRAMER (1980). In the present study no significant synergistic effect of this lipid blend was observed. This poor improvement in the nutritive value of tallow by the addition of soybean lecithin could be due to the low rate of inclusion of the latter in our trial (3.0 g/kg). Higher doses of phospholipids could probably enhance the reported values for the T2 treatment.

Data for AAFA in the experimental diets is shown in Table 4. In agreement with the results obtained for AFA and AME, the individual fatty acid availability in tallow was not significantly affected by the presence of soybean lecithin.

Free fatty acid content

Data for AFA and AME for experimental diets and for TSO and TSAO are presented in Table 3. The effect of FFA was marked. There was a significant reduction in the AFA and AME values from TSO blend (FFA = 25.6 g/kg) to TSAO blend (FFA = 342.9 g/kg), in spite of the fact that both blends presented similar fatty acid profiles. WISEMAN and SALVADOR (1991) reported that the AME of fats linearly decrease with increasing FFA content, and the rate of reduction appeared to be influenced by the degree of saturation, being greater in saturated fats than in unsaturated fats.

Statistical analysis did not show any significant difference for AAFA between TSO and TSAO diets (Table 4). SKLAN (1979), who reported higher absorptions of total fatty acids in a diet with triglycerides than in a diet with free fatty acids, also observed little differences in the individual fatty acid absorption between dietary treatments. It seems reasonable to assume that other factors, besides FFA, could be involved in the marked reduction of the AFA and the AME values of TSAO compared with TSO. Thus, the presence of contaminants from the refining procedures in the SAO fraction of TSAO could reduce the nutritive value of the whole mixture, according to WISEMAN (1986).

Blend of tallow and soybean oil

Data relating to AFA and AME of T2, TSO and SO (Table 3) indicate a superiority of the SO and TSO treatments compared with T2 treatment. Current results confirm that a mixture of tallow and soybean oil (50:50) is equivalent to soybean oil alone in its nutritive value for 5 weeks old chicks, as has been previously indicated by ARTAM (1964). The interaction between T2 and SO was also reflected by the AAFA values obtained for experimental added-fat diets (Table 4). Thus, the mean availability values for each of the studied saturated fatty acids in T2 diet was significatively lower than those obtained for the TSO blend, while corresponding values for SO diet were intermediate between T2 and TSO diets. There was no significant difference for AAFA of the studied unsaturated fatty acids among these three dietary treatments with added fat.

Degree of saturation

Data relating to the effect of U/S ratio of fats and oils with different chemical composition on the AFA of the experimental diets and added fats (Table 3) confirmed the well-known superiority of unsaturated oils over more saturated fats (YOUNG, 1961; WISEMAN and SALVADOR, 1991). Thus T2 and PO, which represented the more saturated fat sources, presented significantly lower mean values for AFA and AME than linseed oil treatment, which represented the more unsaturated fat source. The mean values of AFA and AME obtained for SO were between those

Table 4. Apparent availability of each fatty acid (AAFA) for C16:0, C18:0, C18:1, C18:2, and C18:3 in experimental diets (g/kg)
Scheinbare Verfügbarkeiten der Fettsäuren (AAFA) für C16:0, C18:0, C18:1, C18:2 und C18:3 in den Versuchsrationen (g/kg)

Experimental diets[1]	C16:0[2]	C18:0	C18:1	C18:2	C18:3
Basal diet	690.5^{CD}	835.2^{AB}	654.0^{C}	692.6^{C}	839.7^{B}
Basal diet + PO	776.8^{BCD}	661.7^{BC}	941.1^{A}	907.8^{AB}	902.0^{AB}
Basal diet + Tl	673.9^{D}	585.7^{C}	847.4^{B}	818.8^{B}	871.5^{AB}
Basal diet + T2	742.5^{BCD}	698.3^{BC}	866.9^{AB}	870.9^{AB}	880.2^{AB}
Basal diet + TSO	910.3^{A}	898.2^{A}	950.0^{A}	950.3^{A}	966.4^{A}
Basal diet + TSAO	805.6^{ABC}	764.8^{ABC}	890.5^{AB}	881.9^{AB}	881.9^{AB}
Basal diet + SO	841.7^{AB}	834.6^{AB}	900.1^{AB}	949.6^{A}	967.7^{A}
Basal diet + LO	816.7^{AB}	776.6^{AB}	882.6^{AB}	882.4^{AB}	975.7^{A}
Standard Error	25.2	37.7	17.3	16.3	20.6

A–D Means in the same column with no common superscript differ significantly ($P < 0.01$).
[1] Added fats (60 g/kg into basal diet): PO = palm oil, T1 = tallow without soybean lecithin, T2 = tallow with 50 g/kg added soybean lecithin, TSO = tallow + soybean oil (50:50), TSAO = tallow + soybean acid oil (50:50), SO = soybean oil, LO = linseed oil.
[2] Carbon chain length followed by number of double bonds.

Table 5. Fatty acid profile of abdominal fat (g/kg of total fatty acids)
Fettsäuremuster des Abdominalfetts (g/kg Gesamtfettsäuren)

Dietary treatments[1]	C14:0[2]	C16:0	C16:1	C18:0	C18:1	C18:2	C18:3	U/S[3]
Basal diet	4.6^{C}	250.4^{B}	72.6^{A}	65.4^{AB}	461.5^{A}	126.6^{D}	4.1^{B}	2.08^{C}
Basal diet + PO	5.9^{BC}	273.8^{A}	54.2^{BCD}	48.3^{C}	461.1^{A}	128.5^{D}	4.6^{B}	1.98^{C}
Basal diet + T1	12.0^{A}	226.5^{CD}	58.0^{BC}	75.5^{A}	482.2^{A}	110.6^{D}	5.0^{B}	2.09^{C}
Basal diet + T2	12.0^{A}	233.7^{C}	61.8^{AB}	69.9^{AB}	473.4^{A}	114.8^{D}	5.5^{B}	2.08^{C}
Basal diet + TSO	6.6^{B}	210.4^{D}	41.9^{DEF}	67.6^{AB}	412.6^{B}	227.3^{B}	9.7^{B}	2.44^{B}
Basal diet + TSAO	7.0^{B}	211.1^{D}	47.4^{CDE}	65.9^{AB}	421.8^{B}	218.0^{B}	6.0^{B}	2.45^{B}
Basal diet + SO	2.9^{D}	176.5^{E}	33.2^{F}	54.8^{BC}	347.3^{C}	361.6^{A}	13.6^{B}	3.24^{A}
Basal diet + LO	2.5^{D}	169.4^{E}	35.4^{EF}	60.0^{BC}	362.0^{C}	177.5^{C}	165.5^{A}	3.20^{A}
Standard Error	0.4	4.0	3.0	2.3	46.0	6.3	0.55	0.06

A–F Means in the same column with no common superscript differ significantly ($P < 0.01$).
1 Added fats (60 g/kg into basal diet): PO = palm oil, T1 = tallow without soybean lecithin, T2 = tallow with 50 g/kg added soybean lecithin, TSO = tallow + soybean oil (50:50), TSAO = tallow + soybean acid oil (50:50), SO = soybean oil, LO = linseed oil.
2 Carbon chain lenght followed by number of double bonds.
3 Unsaturated-saturated fatty acids ratio.

for the PO and T2 treatments, and those for the LO treatment. The AFA value over 100 g/kg for LO, derived from the AFA values obtained for the basal diet and for the diet with LO, emphasizes the improvement in the basal fat utilisation by synergistic interactions with the added fat. The AAFA results indicate that although there was no significant difference for AAFA of C16:0 and C18:0 among the fat-supplemented treatments, the mean values obtained for the PO and T2 treatments were lower than those obtained for the SO and LO treatments, which is consistent with the differences for fat utilization detected among dietary treatments. The AAFA values for unsaturated fatty acids were more similar and no significant differences were observed among dietary treatments.

Abdominal fat and skin fatty acid composition

Fatty acid compositions of abdominal and breast skin fats are shown in Tables 5 and 6, respectively. Lipids from adipose tissues showed considerable plasticity in the pattern of fatty acid incorporation when chicks were fed the experimental fats. Therefore, the levels of the predominant fatty acid of each dietary fat were high in both tissues. There was no significant difference in the fatty acid profile between both adipose tissues within the same treatment, in all cases. Therefore, the U/S ratio of lipid extracts from abdominal fat pad and breast skin were nearly equivalent in each dietary treatment.

Although the fatty acid pattern of the lipids in the unsupplemented control diet was more unsaturated than those of the PO, T1 and T2 diets, broilers fed these three relatively saturated added fats presented a similar degree of saturation in the studied tissues when compared to birds fed the former diet. From this it follows that the inability of the lipid fraction of the control diet to influence markedly the fatty acid composition of the adipose tissues may be caused by its low level and its low availability. Thus, fat deposition in the birds fed the control diet would come from de novo synthesis. On the other hand, the SO and LO treatments (rich in polyunsaturated fatty acids) resulted in the highest U/S ratios and in a significant reduction in C16:0 in both tissues. These reductions were not adjusted by de novo synthesis. OLOMU and BARACOS (1991) also reported similar effects on the fatty acid contents of meat of broilers fed different levels of linseed oil in combination with tallow. As it could be expected from the fatty acid profile of the added fats, birds fed the TSO and TSAO blends presented an intermedious U/S ratio in their studied tissues between those obtained for the basal diet, PO, T1, and T2, and those for the LO and PO diets. It appears not to be possible to decrease the degree of unsaturation of broiler body fat by feeding saturated fatty acids. Present results indicate that chicks are able to desaturate fatty acids from saturated fats and the desaturase mechanism prevents the decrease in the U/S ratio beyond a certain level.

Table 6. Fatty acid profile of skin fat (g/kg of total fatty acids)
Fettsäuremuster des Hautfettes (g/kg Gesamtfettsäuren)

Dietary treatments[1]	C14:0[2]	C16:0	C16:1	C18:0	C18:1	C18:2	C18:3	U/S[3]
Basal diet	4.8^{D}	250.2^{B}	71.6^{A}	64.9^{AB}	452.8^{B}	130.0^{DE}	4.6^{B}	20.6^{C}
Basal diet + PO	5.5^{CD}	275.0^{A}	55.4^{B}	47.0^{D}	458.3^{AB}	142.5^{D}	4.9^{B}	20.2^{C}
Basal diet + T1	12.6^{A}	230.6^{C}	58.5^{B}	73.2^{A}	473.1^{A}	112.6^{E}	5.3^{B}	20.5^{C}
Basal diet + T2	12.3^{A}	233.8^{C}	61.1^{B}	68.8^{AB}	468.7^{AB}	120.9^{E}	5.7^{B}	21.0^{C}
Basal diet + TSO	6.5^{C}	206.6^{D}	47.7^{C}	65.3^{AB}	409.7^{C}	230.2^{E}	9.6^{B}	25.1^{B}
Basal diet + TSAO	8.5^{B}	223.6^{C}	47.3^{C}	65.6^{AB}	412.9^{C}	214.7^{B}	5.6^{B}	22.9^{BC}
Basal diet + SO	3.0^{E}	183.9^{E}	35.0^{D}	53.1^{C}	351.0^{D}	346.3^{A}	13.4^{B}	31.2^{A}
Basal diet + LO	2.8^{E}	177.5^{E}	38.7^{D}	60.0^{B}	356.1^{D}	173.2^{C}	163.9^{A}	30.6^{A}
Standard Error	0.4	4.1	2.3	2.2	4.8	4.6	2.3	0.6

A–E Means in the same column with no common superscript differ significantly ($P < 0.01$).
1 Added fats (60 g/kg into basal diet): PO = palm oil, T1 = tallow without soybean lecithin, T2 = tallow with 50 g/kg added soybean lecithin, TSO = tallow + soybean oil (50:50), TSAO = tallow + soybean acid oil (50:50), SO = soybean oil, LO = linseed oil.
2 Carbon chain lenght followed by number of double bonds.
3 Unsaturated-saturated fatty acids ratio.

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Summary

An experiment was designed to study the influence of chemical composition of different fat sources on their nutritive value in broilers chickens of 35 days of age and on the fatty acid profile of the abdominal and skin fats after slaughtering. Palm oil (PO); tallow (T1 and T2); tallow + soybean oil (50:50, TSO); tallow + soybean acid oil (50:50, TSAO); soybean oil (SO) and linseed oil (LO) were selected for the evaluation. Fats, with the exception of T1, contained 50 g/kg of soybean lecithin and all of them were included at 60 g/kg level in a basal diet. Experimental diets and added fats were evaluated for apparent metabolizable energy (AME) and apparent fat availability (AFA). In addition, the apparent availability of fatty acids (AAFA) from experimental diets was determined. At the end of a six week feeding period animals were killed by exsanguination in a commercial processing plant and abdominal fat and breast skin were removed for fatty acid determination. The AFA and AME values obtained for added fats at the studied age ranged between 801.8 g/kg and/or 30.9 MJ/kg (TSAO), and 1047.3 g/kg and/or 40.7 MJ/kg (LO). The fatty acid profile of abdominal fat of a given bird was equivalent to the fatty acid profile of its breast skin, regardless of the diet fed. Feeding the basal diet without fat and diets with PO, T1 and T2 gave the lowest U/S ratio in the studied tissues.

Keywords

broiler, nutrition, fat, fatty acid, apparent fat availability, apparent metabolizable energy, abdominal fat, skin fat

Zusammenfassung

Einfluß des Nährwertes von Futterfetten in Abhängigkeit von der chemischen Zusammensetzung auf das Fettsäuremuster im Abdominal- und Hautfett von Masthühnern

Es wurde ein Versuch durchgeführt, der zum Ziel hatte, die Auswirkungen der chemischen Zusammensetzung von verschiedenen Futterfetten auf ihren Nährwert für Masthühner sowie auf das Fettsäuremuster im Abdominal- und Hautfett zum Zeitpunkt der Schlachtung zu überprüfen. Der Versuch wurde an 35 Tage alten Masthühnern durchgeführt. Für den Vergleich wurden als Fettquellen gewählt: Palmöl (PO), Rindertalg (T1 und T2), Rindertalg + Sojaöl (50:50, TSO), Rindertalg + Sojasäureöl (50:50, TSAO), Sojaöl (SO) und Leinöl (LO). Allen Fetten, mit Ausnahme der Behandlung T1, wurde 50 g/kg Sojalecithin zugesetzt. Die Fette wurden jeweils mit 60 g/kg einer Basisration zugemischt. Für die Versuchsrationen und die verwendeten Fette wurden scheinbare umsetzbare Energie (AME) und die scheinbare Fettverfügbarkeit (AFA) bestimmt. In ähnlicher Weise wurde auch die scheinbare Verfügbarkeit der Fettsäuren in den Versuchsrationen ermittelt. Nach einer Fütterungsphase von 6 Wochen wurden die Tiere auf einer kommerziellen Schlachtanlage geschlachtet und das Abdominalfett sowie die Brusthaut für die Bestimmung der Fettsäuremuster gewonnen. Die ermittelten AFA- und AME-Werte der zugesetzten Fette variierten zwischen 801,8 g/kg bzw. 30,9 MJ/kg (TSAO) und 1047,3 g/kg bzw. 40,7 MJ/kg (LO). Das Fettsäuremuster des Abdominalfettes entsprach innerhalb der Tiere demjenigen der Brusthaut. Die Versuchsration hatte hierauf keinen Einfluß. Die Verfütterung der fettfreien Basisration sowie der Rationen PO, T1 und T2 führte zu den geringsten Verhältnissen von ungesättigten zu gesättigten Fettsäuren (U/S) in den untersuchten Geweben.

Stichworte

Broiler, Fütterung, Futterfett, Fettsäuren, Fettverfügbarkeit, umsetzbare Energie, Abdominalfett, Hautfett

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Korrespondenzadresse: Dra. Ana C. Barroeta, Unitat Docent de Nutrició i Alimentació Animals, Facultat de Veterinària, Universitat Autònoma de Barcelona, 08193 Bellaterra, Catalonia, Spain