EFFECTS OF THREE DIET TRIALS ON FATTY ACID COMPOSITION OF POULTRY MEAT

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Introduction: The consumption of poultry meat increased in last decade in Yugoslavia. Stimulated industrial meat production is introducing new dietary sources for animal nutrition that could affect meat quality. The current study was undertaken to compare dietary effects of three animal diets based on corn meal, commercial feed with fish flour and a mixture of corn meal and rapeseed. According to various literature sources rapeseed as a main component of animal feed has certain toxic effects on liver, heart and adrenal glands of experimental animals (1,2,3). The main cause of these pathological changes is erucic acid ($C_{22:1}$, n-9). Fish flour could also contain fatty acids with more than 20 C-atoms, especially cetoleic acid ($C_{22:1}$, n-11) that is isomer of erucic acid, but without it toxic influence. It was of interest to investigate the effects of various dietary polyunsaturated fatty acid levels on the fatty acid composition of poultry meat.

Methods: Thirty three eleven-weeks old Ross broilers (aprox. weight 400g) were placed in pens (30 birds/pen) and fed with one of three experimental diets for 60 days. The following diets were used: (I) control based on corn-meal , (II) commercial feed based on fish flour and (III) mixture of corn meal (90%) and rapeseed (10%). All diets were isoenergetic (±10%). The macronutrient and fatty acid composition of used diets is shown in table 1. Diets and water were administered to the chicks *ad libitum*. At the time of slaughter chicks were of average weight of 2500 - 3000g. Chics were sacrificed by decapitation and hung until bleeding was complete. Chicken carcasses were hand-deboned, tendons and visible fat were removed and carcasses were wrapped in polyethylene foil and stored at -18°C. For initial analyses frozen carcasses were thawed at room temperature and average poultry meat samples were made by grounding and pooling together breast, leg and back muscles.

Total lipids were extracted from poultry meat samples with chloroform - methanol - water mixture (1:2:0.8, v/v) according to the procedure of Bligh E.G. & Dyer W.J. (4). Phospholipid and triacylglycerol classes of total lipids were separated on preparative silica gel G plates using so-called Mangold system as a mobile phase (petroleum ether - diethyl ether - glacial acetic acid = 80:20:1,v/v) (5). Detection of lipids was obtained by spraying the plates with 0.2% ethanolic dichlorofluoresceine and viewing them under UV light. Recovery of lipid classes from the zones scraped from plates was accomplished with methanol - chloroform (2:1,v/v) for phospholipids, and with diethyl ether for triacylglycerols.

Fatty acid composition of total lipids, phospholipids and triacylglycerols was determined on VARIAN-1400 gas chromatograph equipped with flame ionization detector. Lipid samples were transesterified to the corresponding methyl esters according to the method of Metcalfe L.D. & Smitz A.A.(6).

Results and discussion: Fatty acid composition in experimental diets differed significantly. The content of erucic acid in the lipids of rapeseed-based diet was aprox. 20%. Commercial feed contained small amount of cetoleic acid. The highest amount of linoleic acid was in the lipids of the corn meal diet (57%).

Fatty acid composition of total lipids, phospholipids and triacylglycerols is shown in tables 2,3 and 4.

Obtained results indicate no significant differences in fatty acid content of all analyzed lipid classes among all experimental groups. The fatty acid content in poultry total lipids was not influenced by lipid dietary source. The erucic and cetoleic acids' content in poultry lipids was low , although it was significantly present in broilers' diets. In all experimental groups the content of linoleic acid in total lipids was aprox. 20%. Shown results are comparable with literature data, with exception of erucic acid content that was aprox. 1% in analyzed poultry meat from the third group (7). Low levels of erucic acid in analyzed meat samples from chics fed rapeseed indicate that it zoo-technical use in animal nutrition may not have adverse effects on the consumers' health.

On the basis of the obtained results it could be concluded that rapeseed could participate with 10% in usually used corn meal broilers' diets as was indicated in some of earlier publications (8,9).

Table 1: Composition and energy value of broiler diets

	I	II	III
Proteins (%,DM basis)	11.5	24.7	12.6
Lipids (%,DM basis)	5.5	8.5	9.4
Carbohydrates (%,DM basis)	78.2	53.3	72.0
Energy value (MJ/kg)	17.4	16.9	17.8
Fatty acids (%)			
14:0	1.0	1.2	trace
16:0	12.6	17.5	9.8
16:1	-	0.8	0.4
17:0	-	trace	-
18:0	2.0	6.8	1.3
18:1	25.7	34.9	23.8
18:2	57.5	33.8	33.9
18:3	1.2	1.8	2.6
20:0	-	trace	-
20:1	-	1.1	10.1
22:1 ,n-11 (cetoleic)	-	1.7	-
22:1 ,n-9 (erucic)	-	-	17.7

Table 2: Fatty acid composition of total lipids in poultry meat

Group	Fatty acids											
	16:0	**16:1**	**18:0**	**18:1**	**18:2**	**18:3**	**20:1**	**20:2**	**N.I.***	**20:3**	**22:1 n-11**	**22:1 n-9**
I	24.0	4.8	7.9	39.6	21.2	1.4	0.4	0.3	-	0.3	-	-
II	27.6	5.4	7.2	39.6	19.4	0.6	0.05	-	-	-	trace	-
III	20.9	2.2	15.1	30.2	21.0	0.7	1.7	0.4	0.3	6.4	-	0.8

N.I. = not identified

Table 3: Fatty acid composition of phospholipids in poultry meat

Group	Fatty acids													
	14:0	**16:0**	**16:1**	**18:0**	**18:1**	**18:2**	**18:3**	**20:1**	**20:2**	**N.I.**	**20:3**	**22:1 n-11**	**22:1 n-9**	**N.I.**
I	8.5	22.6	3.6	13.5	27.9	14.9	0.6	0.8	-	0.8	5.4	-	-	1.4
II	2.9	35.1	6.6	5.8	40.2	1.1	1.6	2.7	-	3.8	-	trace	-	-
III	5.3	24.8	7.4	5.9	40.6	5.8	1.4	3.4	3.6	-	-	-	1.1	-

Table 4: Fatty acid composition of triacylglycerols in poultry meat

Group	Fatty acids													
	14:0	**16:0**	**16:1**	**18:0**	**18:1**	**18:2**	**18:3**	**20:1**	**20:2**	**N.I.**	**20:3**	**22:1 n-11**	**22:1 n-9**	**N.I.**
I	1.0	21.7	4.9	6.2	38.2	22.2	1.6	-	0.2	-	-	-	-	0.2
II	trace	26.1	4.7	9.3	46.6	11.5	0.2	0.8	-	-	0.2	0.1	-	-
III	0.8	21.0	4.0	6.8	41.3	19.5	1.7	2.4	0.5	0.1	0.3	-	1.5	-

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