

Plant-Based Diets Containing Ca-Salts of Fatty Acids and Their Influence on Performance, Carcass Characteristics, and Health Status of Broiler Chickens

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Abstract

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The main goal of the study was to test two plant-based diets designed according to our own procedure and to compare their production efficiency. Furthermore, the effect of both diets on the carcass parameters and chickens' state of health was evaluated in order to explore the possibility of replacing vegetable oils by Ca-salts of fatty acids.

The experiment was carried out with 140 chickens divided into 2 groups each consisting of 70 chickens (35 males and 35 females). As the source of energy specially treated oils - Ca-salts of fatty acids - were used in diet of experimental group while the soy oil was used in control group. The experiment was terminated on the 42nd day of the fattening. The mean live weight of female and male chickens in the experimental group on the 42nd day was 2.11 kg and 2.20 kg, respectively; the weight of control females and males was 2.18 kg and 2.50 kg, respectively. Significantly lower live weight of males ($p \leq 0.01$) was also reflected in the carcass yield 1448.70 g ($p \leq 0.05$), in the weight of skinned thighs 444.01 g ($p \leq 0.01$) and thighs without skin 395.68 g ($p \leq 0.01$), and in the weight of upper thighs 204.54 g ($p \leq 0.01$) and lower thighs 191.14 g ($p \leq 0.05$). No significant differences were found in the weight of breast muscles and abdominal fat. Despite the above differences in weights, no conclusive differences between the experimental and control groups of chickens were found in the yield of carcass and the yield of individual parts of carcass. Chickens' state of health examined on the basis of haematological and biochemical analyses of blood plasma were also evaluated in this study. The results of these analyses showed that either diet had no negative effect on chickens' metabolism and that both plant-based diets were suitable for the feeding of chickens. It was also found that the substitution of vegetable oils with Ca-salts of fatty acids in a feeding mixture produced no negative effects on the carcass characteristics or health status of chickens. However, the composition of a diet must reflect the difference between the energy values of oils and Ca-salts of fatty acids.

Chickens, fattening, carcass yield, haematology, blood biochemistry

The fattening of broiler chickens is one of the most important branches of the worldwide production of poultry meat.

Hybrids with high utility parameters are currently available. However, such a genetic material requires optimum rearing conditions which would enable the maximum exploitation of the genetic potential of the particular hybrids. Nutrition is one of the most important factors in this respect. Feeding mixtures should therefore consist not only of high-quality proteins but they should also contain sufficient amount of energy necessary for high-intensity growth. Increasing demands for energy in growing chickens can be satisfied by the addition of fat to the feeding mixtures (up to 10%).

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Due to bovine spongiform encephalopathy (BSE) efforts have been made to remove potentially hazardous animal-based raw materials including animal fat from feeding mixtures. This also resulted in efforts to substitute animal fat in feeding mixtures used to feed broiler chickens with vegetable oils. Unlike animal fat, vegetable oils have favourable dietetic effects as they contain a higher level of polyunsaturated acids, and also cholesterol is absent in vegetable oils. Cholesterol is transported by low-density lipoproteins (LDL) which enable its entry to the cell by binding to the cell membrane receptors. Increased cholesterol level, which is presented by VLDL (very low-density lipoproteins), IDL (intermediate density lipoproteins) and LDL, is in relation to atherosclerosis, while high level of HDL (high-density lipoproteins) has opposite effect. The function of HDL is to remove cholesterol from tissues.

Partial or total replacement of animal fat (tallow) in diets for chickens with vegetable oils (sunflower, cotton, soy and rape-seed) was studied by a number of authors (Kirkpınar et al. 1999; Balevi and Coskun 2000; Bickel et al. 2001). These authors found that neither production efficiency of feeding mixtures nor carcass parameters were negatively affected by the diets enriched in vegetable oils. Oils made of sunflower and maize added to the feeding mixtures showed a positive effect on the growth intensity of chickens. Valencia et al. (1993) reported that the use of raw or refined palm oil had no negative effect on the yield of carcass or the content of abdominal fat.

Bilal et al. (2001) pointed out a positive effect of sunflower oil on performance. On the basis of their experiments, Zollitsch et al. (1997) concluded that broiler chickens receiving the feeding mixture with vegetable fat grew faster. These authors, however, did not demonstrate the effect of the kind of fat administered on the amount of abdominal fat and breast and thigh muscles. Krasicka et al. (2000) and Crespo et al. (2001) showed enhanced performance and improved quality of meat in broiler chickens that received an increased amount of n-3 PUFA after the addition of flax oil.

There are almost no data in scientific literature on the use of vegetable oils in the form of Ca-salts of fatty acids which could potentially replace traditional vegetable oils in feeding mixtures used for chickens fattening. This form of fat offers the following advantages: higher stability (particularly of polyunsaturated fatty acids), suitable application form (solid loose substances), and an important source of calcium.

The aim of our study was to find out whether vegetable oils contained in the feeding mixtures used in the fattening of broiler chickens can be replaced by Ca-salts of fatty acids (Energol R and Energol S).

Materials and Methods

The experiment was conducted with COBB 500 broiler chickens in an approved experimental stable of the Department of Nutrition, Dietetics, Zoohygiene and Plant Products at the Faculty of Veterinary Hygiene and Ecology, University of Veterinary and Pharmaceutical Sciences in Brno.

The experiment was carried out with the total of 140 one-day-old chickens divided into two groups (experimental and control); each consisting of 70 chickens (35 females and 35 males). Female and male chickens housed on deep litter were fed separately in compliance with the requirements for the fattening of COBB 500 broilers. The chickens were fed and watered *ad libitum* using plastic tube feeders and automatic hanging drinkers which enabled the monitoring of the daily consumption of both feed and water.

Three complete feeding mixtures were used for the fattening of chickens: BR1 (day 1-14), BR2 (day 15-30) and BR3 (day 31-42). The animal-based component in the feeding mixture (meat-and-bone meal) was replaced by a specially treated rape seed (Proenergol V80 and Proenergol V100). Proenergol is commercially produced protein feed prepared by thermal treatment of rape pellets in reactor using CaO. The difference between Proenergol V80 and Proenergol V100 lies in fact, that Proenergol V100 is produced only from rape pellets (100%), while Proenergol V80 from the mixture of rape pellets (80%) and rape seed (20%). Soy oil in the mixtures for the fattening of experimental chickens was replaced with Energol R and Energol S. Energol is commercially produced feed on the vegetable oils basis (rape-seed oil - R, soy oil - S) prepared by thermal treatment of oil in reactor using CaO. These technological processes are protected by patent. The composition of the feeding mixtures is provided in Table 1. Feeding mixture analysis was performed using basic methods of laboratory feed examinations.

Table 1
Composition of the feeding mixtures (C)- control, (E)- experiment

Components (%)	BR1 (E)	BR1 (C)	BR2 (E)	BR2 (C)	BR3 (E)	BR3 (C)
Wheat	51.80	52.30	59.50	60.10	66.90	67.70
Soya ex. meal 46%	24.00	24.00	20.00	20.00	17.00	17.00
Vitex Q (yeast)	2.50	2.50	2.50	2.50	2.50	2.50
Proenergol V 80	5.00	5.00	5.00	5.00	5.00	5.00
Proenergol V 100	10.00	10.00	5.00	5.00	-	-
Energol R	3.00	-	3.50	-	4.00	-
Energol S	1.00	-	2.00	-	2.00	-
Lys-HCl 100%	0.47	0.47	0.47	0.47	0.60	0.60
D,L-Met. 100%	0.24	0.24	0.25	0.25	0.22	0.22
L-Thr. 100%	0.10	0.10	0.11	0.11	0.13	0.13
Monocalcium phosphate	0.75	0.75	0.60	0.60	0.50	0.50
Mononatrium phosphate	0.48	0.48	0.44	0.44	0.50	0.50
Feeding salt	0.16	0.16	0.18	0.18	0.15	0.15
Ground limestone	-	0.80	-	0.15	-	1.20
Soya oil	-	2.70	-	3.75	-	4.00
Premix Mikrop-Čebín	0.50	0.50	0.45	0.45	0.50	0.50
Nutrients (g/kg)						
Crude protein	248.90	217.80	204.60	207.80	204.60	201.50
Fat	66.70	69.00	62.40	76.20	62.40	69.50
Fibre	32.80	28.80	14.60	23.00	14.60	22.70
Nitrogen-free extracts	583.80	523.20	548.00	533.10	548.00	549.30
Ash	67.80	58.10	52.10	54.20	52.10	47.90
Ca	13.91	11.60	10.80	11.16	10.80	9.77
P	8.20	7.00	6.30	6.49	6.30	6.50
Mg	2.72	2.67	1.93	1.93	1.93	1.70
Fe	0.075	0.075	0.070	0.070	0.070	0.070
Cu	0.014	0.014	0.012	0.012	0.012	0.012
vitamin A (iu/kg)	15 000	15 000	13 500	13 500	12 000	12 000
vitamin D ₃ (iu/kg)	5 000	5 000	4 500	4 500	4 000	4 000
vitamin E (mg/kg)	50	50	45	45	40	40
ME (MJ/kg)	11.90	12.20	12.10	12.50	11.90	12.30

The experiment was terminated on the 42nd day and the chickens were weighed (LW1 - basic group). On the basis of the mean body weight, 10 female chickens and 10 male chickens were selected from each group (LW2 - selected group) for haematological and biochemical examination and for the evaluation of carcass parameters.

Blood was taken from *vena basilica*, stabilized by heparin and subjected to haematological and biochemical analysis. The total erythrocyte count (Er) and total leukocyte count (Le) using a flask dilution method and counting blood cells in Bürker chamber were determined. Also photometric determination of haemoglobin content (Hb) at the wavelength of 540 nm using Drabkin solution, and the determination of haematocrit (Hk) using the Janetzki microhaematocrit method were carried out. Blood plasma was analysed for the following parameters: the total protein content (TP), glucose (Gl), triglycerides (TG), lipoproteins (HDL and LDL), phospholipids (PL), and the photometric determination of molar concentrations of transaminases (AST and ALT) using commercially available BIO-LA-TESTS (Pliva Lachema, j.s.c.).

After slaughter, the selected chickens were examined for the following parameters: carcass weight (CSW), the weight of abdominal fat (WAF), the weight of breast muscles (WBM), the weight of unskinned thighs (WUST), the weight of skinned thighs (WST), the weight of upper thighs (WUT) and the weight of lower thighs (WLT). These values were used to calculate the yield of carcass (YC), the yield of abdominal fat (YAF), the yield of breast muscles (YBM), the yield of unskinned thighs (YUST), the yield of skinned thighs (YST), the yield of upper thighs (YUT) and the yield of lower thighs (YLT). The yields are expressed in per cent, relative to the live weight of chickens.

The results obtained were processed using the program STATGRAPHICS. Statistical parameters such as arithmetic mean (x) and standard deviation (sd) are introduced in Tables. Student *t*-test was used to evaluate significance of the mean values (td) with the probability of $p \leq 0.05$ (*) and $p \leq 0.01$ (**).

Results

The chickens were fattened until the age of 42 days. The live weight of females and males in the experimental group (basic group) was 2.11 kg and 2.20 kg, respectively, while in the control group (basic group) the live weight of females and males was 2.18 kg and 2.50 kg, respectively. The conversion of the feeding mixture in the experimental group was 2.00 kg (females) and 1.98 kg (males) per kg of weight gain, while in the control group the conversion was 1.87 kg (females) and 1.84 kg (males) per kg of weight gain.

Table 2

Live weight and carcass parameters of broiler chickens on the 42nd day of fattening (W-weight, 1-basic group, 2-selected group, Y-yield, L-live, CS-carcass, AF-abdominal fat, BM-breast muscles, UST-unskinned thighs, ST-skinned thighs, UT-upper thighs, LT-lower thighs, F-females, M-males, * $p \leq 0.05$, ** $p \leq 0.01$)

Parameter	Group (Sex)	x	sd	td	Parameter	x	sd	td
LW2 (g)	Exp. (F)	2 107	123.16	1.387	LW1 (kg)	2.11	0.187	1.758
	Contrl (F)	2 179	107.55			2.18	0.151	
	Exp. (M)	2 197	119.85	*		2.20	0.276	**
	Contrl (M)	2 551	418.00	2.579		2.50	0.492	2.936
WCS (g)	Exp. (F)	1 407	85.79	1.644	YCS (%)	66.80	1.180	1.146
	Contrl (F)	1 466	74.27			67.31	0.768	
	Exp. (M)	1 448	88.28	*		65.94	1.077	1.266
	Contrl (M)	1 703	292.15	2.645		66.78	1.798	
WAF (g)	Exp. (F)	31	11.74	0.167	YAF (%)	1.48	0.465	0.048
	Contrl (F)	32	10.66			1.47	0.469	
	Exp. (M)	21	4.56	1.623		0.99	0.211	0.984
	Contrl (M)	29	13.55			1.14	0.432	
WBM (g)	Exp. (F)	344	32.35	1.297	YBM (%)	16.35	1.263	0.619
	Contrl (F)	363	31.34			16.66	0.952	
	Exp. (M)	345	36.05	1.966		15.72	1.253	0.397
	Contrl (M)	407	92.77			15.96	1.445	
WUST (g)	Exp. (F)	428	36.16	1.076	YUST (%)	20.33	0.888	0.106
	Contrl (F)	443	27.46			20.37	0.802	
	Exp. (M)	444	33.89	**		20.21	0.833	1.612
	Contrl (M)	532	89.07	2.945		20.88	1.017	
WST (g)	Exp. (F)	388	30.74	0.385	YST (%)	18.45	0.793	1.152
	Contrl (F)	393	23.77			18.06	0.718	
	Exp. (M)	395	31.18	**		18.01	0.822	1.772
	Contrl (M)	478	78.65	3.102		18.76	1.057	
WUT (g)	Exp. (F)	203	23.38	0.504	YUT (%)	9.64	0.936	0.367
	Contrl (F)	207	13.46			9.52	0.440	
	Exp. (M)	204	17.07	**		9.31	0.591	*
	Contrl (M)	254	44.10	3.333		9.97	0.597	2.482
WLT (g)	Exp. (F)	185	15.05	0.071	YLT (%)	8.81	0.364	1.596
	Contrl (F)	186	12.00			8.54	0.392	
	Exp. (M)	191	19.00	*		8.70	0.596	0.308
	Contrl (M)	224	37.14	2.493		8.79	0.706	

An overview of the mean live weights of chickens is in Table 2. Statistical processing of the results showed no statistically significant differences in the mean weight of female chickens. However, the mean live weight of control males was significantly higher ($p \leq 0.01$) than that of males in the experimental group. The higher mean live weight of males in the control group on the 42nd day significantly affected (in comparison with the experimental group) ($p \leq 0.01$) the weight of carcass (control: 1703.96 g, experiment: 1448.70 g), the weight of thighs without skin (control: 532.77 g, experiment: 444.01 g) and the weight of skinned thighs (control: 478.68 g, experiment: 395.68 g). The mean weight of upper thighs in control males (254.39 g) was shown to be very significantly higher (204.54 g; $p \leq 0.01$). Similarly, the mean weight of lower thighs in control males (224.29 g) differed significantly ($p \leq 0.05$) from that of the males in the experimental group (191.14 g).

The increased weight of carcass in control males did not result in significant differences in the weight of both abdominal fat (control: 29.09 g, experiment: 21.75 g) and breast muscles (control: 407.24 g, experiment: 345.37 g). No significant differences between chickens in the control and experimental groups were found in any of the monitored parameters.

Table 3

The results of both haematological and biochemical examination of chickens on the 42nd day (Er-the total count of erythrocytes, Hb- haemoglobin content, Hk-haematocrit value, Le-the total count of leukocytes, CP-plasma protein, Gl-glucose, TG-triglycerides, HDL, LDL-lipoproteins, PL-phospholipids, transaminases AST and ALT, F-females, M-males, * $p \leq 0.05$, ** $p \leq 0.01$)

Parameter	Group (Sex)	x	sd	td	Parameter	x	sd	td
Er T/l	Exp. (F)	2.24	0.327	1.678	TG mmol/l	2.02	0.597	2.077
	Contrl (F)	2.51	0.390			3.05	1.45	
	Exp. (M)	2.42	0.586	0.446		1.76	0.564	1.140
	Contrl (M)	2.53	0.516			2.22	1.146	
Hb g/l	Exp. (F)	88.82	8.880	2.094	HDL mmol/l	2.54	0.392	1.066
	Contrl (F)	96.34	7.083			2.76	0.521	
	Exp. (M)	91.29	10.539	1.172		2.66	0.468	1.135
	Contrl (M)	96.27	8.335			2.45	0.350	
Hk l/l	Exp. (F)	0.31	0.036	1.571	LDL mmol/l	1.06	0.165	0.926
	Contrl (F)	0.33	0.018			1.14	0.218	
	Exp. (M)	0.31	0.033	0.709		1.23	0.340	0.822
	Contrl (M)	0.32	0.030			1.13	0.178	
Le G/l	Exp. (F)	14.80	2.163	0.340	PL mmol/l	31.73	7.086	0.986
	Contrl (F)	14.50	1.764			28.50	7.557	
	Exp. (M)	16.80	5.413	0.350		25.47	6.364	0.927
	Contrl (M)	16.10	3.257			27.98	5.729	
CP g/l	Exp. (F)	35.24	1.157	1.183	AST µkat/l	0.91	0.083	0.529
	Contrl (F)	36.51	3.192			0.93	0.086	
	Exp. (M)	37.66	4.059	0.278		1.04	0.124	0.670
	Contrl (M)	38.11	3.133			1.01	0.069	
Gl mmol/l	Exp. (F)	14.10	1.240	0.789	ALT µkat/l	0.035	0.011	1.421
	Contrl (F)	14.57	1.419			0.043	0.014	
	Exp. (M)	12.07	2.331	*		0.044	0.030	0.717
	Contrl (M)	14.32	1.677	2.478		0.053	0.026	

The effect of the diet on parameters such as the yield of carcass, the yield of abdominal fat, the yield of breast muscles, and the yield of thighs, which are the most valuable parts of carcass, was evaluated. One interesting fact is that (Table 2) the live weight and the weight

of carcass, which were significantly higher in control males, did not affect the yield of both carcass and its individual parts as compared with the experimental group. Similarly, no statistically significant differences between control and experimental groups of female chickens were found in the yield of both carcass and its individual parts. However, the yield of upper thighs in males was significantly higher (9.97%, $p \leq 0.05$) than that in females.

The study also included haematological and biochemical examination of blood to assess the effect of the tested diet on the metabolic profile of the experimental chickens. Table 3 presents no significant differences between the control and experimental group in following blood parameters: Er, Hb, Hk, Le. In opposite of this fact, molar concentration of glucose in the experimental males (12.07 mmol/l) was significantly lower ($p \leq 0.05$) than that of the control males (14.32 mmol/l). No significant differences were found in other monitored parameters (TG, HDL, LDL, PL, AST, and ALT). During the whole period of the fattening the chickens showed no clinical symptoms of disease. No differences between the groups were found in the death rate. The death rate during the fattening was 6.25% in the experimental group and 5.00% in the control group which corresponds to that of chickens reared in operational conditions.

Discussion

The present work addresses the problem of the replacement of vegetable oils in feeding mixtures with Ca-salts of fatty acids in the fattening of broiler chickens.

The efficiency of chickens gained in the experiment shows that the diet consisting exclusively of plant-based feed can be successfully used. On the 42nd day the live weight of chickens in the control group was higher than that claimed in the technological procedure for the fattening of COBB 500 broilers. According to this procedure the weight of COBB 500 female and male chickens on the 42nd day of the fattening should be 2.009 kg and 2.347 kg, respectively. However, the live weight of control females and males was 2.18 kg and 2.50 kg, respectively. These results confirm the conclusions drawn by Ristic et al. (2001) that the use of vegetable proteins in feeds resulted not only in a significant increase of chickens' live weight but it also increased the weight of carcass and the yield of valuable parts of carcass (breast muscles and thighs).

A comparison between the two tested diets – one containing vegetable oils (control) and the other consisting of Ca-salts of fatty acids (experiment) - demonstrates the differences in production efficiency due to sex. In the case of female chickens, no significant difference between the control (2.18 kg) and experimental group (2.11 kg) was found in the mean live weight on the 42nd day of the fattening. On the other hand, efficiency was different in the case of male chickens on the 42nd day of the fattening. The mean live weight of males in the control group (2.50 kg) was very significantly higher ($p \leq 0.01$) compared with that of males in the experimental group (2.20 kg). The difference between the production efficiency of the two feeding mixtures in males and females arises probably due to the fact that oils differ from Ca-salts of fatty acids in energy content, which is documented by ME values of the feeding mixtures administered to chickens in the control group.

The content of energy fully satisfied the energy demands in both control and experimental groups of female chickens. However, in the case of males the content of energy in the feeding mixtures was not sufficient to meet the energy demand due to increased growth intensity. This may explain a significantly lower live weight of males ($p \leq 0.01$) in the experimental group (2.20 kg) compared with the control group (2.50 kg). These results justify the use of different feeding mixtures for female and male chickens in order to meet chickens' demands for energy and specific nutrients.

The experiment also included the evaluation of the carcass parameters. The results of the evaluation showed that the weight of thighs without skin (532.77 g) and skinned thighs

(478.68 g) in the control males was significantly higher ($p \leq 0.01$) than that of males in the experimental group (444.01 g, 395.68 g). The increase of the weight of thighs in males was accompanied with a significant increase ($p \leq 0.01$) of the weight of upper thigh (control: 254.39 g, experimental: 204.54 g) and a significant increase ($p \leq 0.05$) of the weight of lower thighs (control: 224.29 g, experimental: 191.14 g). The increase of the mean weight of thighs corresponds to a significantly higher weight of carcass of males in the control group (1 703.96 g) compared with that of male chickens in the experimental group (1 448.70 g). The increased weight of carcass of control males had no significant effect on the weight of breast muscles or the weight of abdominal fat.

The findings concerning the yield of carcass and the yield of individual muscles are interesting. Although both groups of male chickens differed in the mean live weight and in the weight of carcass, the differences in the yield of carcass and the yield of individual body parts were not statistically significant. It can be concluded from the results that all part of chickens' body developed evenly with increasing growth intensity reaching a higher live weight. It follows from the results that both forms of fat administered to the chickens influenced the growth intensity in males but showed no effect on the yield of carcass and its individual parts except for the yield of upper thighs which was significantly higher ($p \leq 0.05$) in the control males (9.97%) compared with that of males in the experimental group (9.31%). The results are in good agreement with those of the experiments performed by Bickel et al. (2001), Valencia et al. (1993), Bilal et al. (2001), Zollitsch et al. (1997), and Krasicka et al. (2000) who found that the yields of carcass were not significantly influenced by the origin of fat used in the feeding mixture.

The monitoring of chickens' state of health included clinical evaluation and haematological and biochemical examination of blood taken at the end of the experiment, i.e. on the 42nd day of the fattening, do not confirmed negative effects of feed mixture. Our results of haematological and biochemical examinations of blood are in good agreement with the conclusions reported by Bilal et al. (2001) who showed that various kinds of fat used in the nutrition of broilers had no effect on haematological parameters. Haematological and biochemical examination showed that the values of all monitored parameters were in the physiological range known for healthy chickens. Similar results obtained in haematological and biochemical studies of broiler chickens were published by Stevanovic et al. (1990), Straková et al. (1993), Suchý et al. (2000), and Straková et al. (2000).

On the basis of the above results it can be concluded that the Ca-salts of fatty acids have no negative effect on chickens' state of health and the quality of carcass and may therefore be used in the fattening of broiler chickens. When designing a composition of the feeding mixture, one must realize that the energy value of Ca-salts of fatty acids is lower than that of commonly used fats and oils. Otherwise, it might result in the decrease of growth intensity of chickens. This particularly applies to fast-growing male chickens in the final phase of fattening.

Porovnání vegetabilních diet s obsahem Ca-solí mastných kyselin a jejich vliv na užítkovost, jatečnou hodnotu a zdravotní stav brojlerových kuřat

Cílem práce byla testace dvou vegetabilních diet vlastní receptury, srovnání jejich produkční účinnosti a posouzení vlivu těchto diet na jatečnou hodnotu a zdravotní stav vykrmovaných kuřat, s možností náhrady rostlinných olejů v kontrolní dietě Ca-solemi mastných kyselin v pokusné dietě.

Do pokusu bylo zařazeno celkem 140 kuřat, která byla rozdělena do 2 skupin po 70 kuřatech (35 kohoutků a 35 slepiček). Pokusná skupina dostávala dietu se speciálně ošetřenými tuky v podobě Ca-solí mastných kyselin a kontrolní skupina dietu s rostlinnými oleji. Experiment byl ukončen ve 42. dnu výkrmu, kdy kuřata dosáhla průměrné živé

hmotnosti u pokusné skupiny 2,11 kg (slepičky) a 2,20 kg (kohoutci), u kontrolní skupiny 2,18 kg (slepičky) a 2,50 kg (kohoutci). Vysoce průkazně nižší ($p \leq 0,01$) živá hmotnost u kohoutků pokusné skupiny statisticky významně ovlivnila i jejich hmotnost jatečně opracovaného těla 1448,70 g ($p \leq 0,05$), hmotnost stehen s kůží 444,01 g ($p \leq 0,01$) i bez kůže 395,68 g ($p \leq 0,01$), hmotnost horních stehen 204,54 g ($p \leq 0,01$) a hmotnost dolních stehen 191,14 g ($p \leq 0,05$). U hmotnosti prsní svaloviny a abdominálního tuku tyto průkazné rozdíly potvrzeny nebyly. Přes výše uvedené hmotnostní rozdíly nebyly u výtěžnosti jatečně opracovaného těla ani u výtěžnosti jednotlivých částí jatečného těla potvrzeny průkazné rozdíly mezi pokusnými a kontrolními kuřaty, s výjimkou výtěžnosti horních stehen ($p \leq 0,05$).

Součástí práce bylo na základě hematologických a biochemických vyšetření krevní plazmy posoudit zdravotní stav kuřat. Výsledky vyšetření potvrzují, že testované diety neměly negativní vliv na metabolismus kuřat.

Výsledky experimentu dokládají, že lze úspěšně realizovat výkrm kuřat na vegetabilních dietách. Za nový poznatek lze pokládat, že v dietách pro vykrmovaná kuřata lze nahradit rostlinné oleje Ca-solemi mastných kyselin, aniž by tyto negativně ovlivnily jatečnou hodnotu těla kuřat a jejich zdravotní stav. Při sestavování diet je však nutné respektovat rozdílný obsah energie v olejích a v Ca-solích mastných kyselin.

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References

- BALEVI, T, COSKUN, B 2000: Effects of some oils used in broiler rations on performance and fatty acid composition in abdominal fat. *Rev Med Vet* **151**: 937-944
- BICKEL, S, WETSCHEREK, W, LEITGEB, R 2001: Influence of fat source on performance of broilers, and on relevant carcass characteristics for consumer - 1 (st) Report: Influence of rapeseed oil and animal fat on growing and slaughtering performance of broilers. *Bodenkultur* **52**: 45-53
- BILAL, T, OZPINAR, H, ABAS, I, KUTAY, H C 2001: The effects of different fat sources used in broiler rations on performance, abdominal fat accumulation and fat digestibility. *Arch Geflugelkd* **65**: 251-257
- CRESPO, N, ESTEVE-GARCIA, E 2001: Dietary fatty acid profile modifies abdominal fat deposition in broiler chickens. *Poult Sci* **80**: 71-78
- KIRKPINAR, F, TALUG, A M, ERKEK, R, SEVGICAN, F 1999: The effects of different fat sources on performance and fat deposition of broilers. *Turk J Vet Anim Sci* **23**: 523-532
- KRASICKA, B, KULASEK, G W, SWIERCZEWSKA, E, ORZECHOVSKI, A 2000: Body gains and fatty acid composition and carcasses of broilers fed diets enriched with full-fat rapeseed and/or flaxseed. *Arch Geflugelkd* **64**: 61-69
- RISTIC, M, DAMME, K 2001: Changing from animal to vegetable protein at the fattening - Consequences on carcass and meat quality of broiler. *Fleischwirtschaft* **81**: 114-116
- STEVANOVIC, J, PAVLOVIC, O, VUKICEVIC, Z, MAROSEVIC, P 1990: Quantitative and qualitative changes in the blood proteins of broiler chicks fattened under combined natural and artificial lighting. *Veterinarski-Glasnik* **44**: 371-376
- STRAKOVÁ, E, SUCHÝ, P, KLECKER, D 1993: Změny hematologických a biochemických ukazatelů krve brojlerů v průběhu výkrmu. *Czech J Anim Sci* **38**: 725-734
- STRAKOVÁ, E, SUCHÝ, P 2000: Changes in hematological parameters during different feeding programs of broiler chickens. *Vet Med - Czech* **45**: 121
- SUCHÝ, P, STRAKOVÁ, E, ILLEK, J 2000: Changes in biochemical parameters during different feeding programs of broiler chickens. *Vet Med - Czech* **45**: 120
- VALENCIA, ME, WATKINS, SE, WALDROUP, AL, WALDROUP, PW, FLETCHER, DL 1993: Utilisation of crude and refined palm and palm kernel oils in broiler diets. *Poult Sci* **72**: 2200-2215
- ZOLLITSCH, W, KNAUS, W, AICHINGER, F, LETTNER, F 1997: Effects of different dietary fat sources on performance and carcass characteristics of broilers. *Anim Feed Sci Technol* **66**: 63-73