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High-protein fraction of 00 type rapeseed meal in broiler nutrition

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ABSTRACT

Two batches of a commercial double-low rapeseed meal (RSM) were separated into two fractions on sieves with a mesh diameter of 0.5 mm. In the higher-protein fractions (HP-RSM), which constituted about 35% of regular RSM (R-RSM), the crude protein level increased by 16% in the first batch and by 11% in the second, while crude fibre decreased by 19 and 14%, respectively. The glucosinolate (GLS) content rose from 15.5 to 16.7 μM/g defatted DM in the first batch and from 10 to 11.9 μM/g in the second. In both batches HP-fractions contained less methionine and cystine, while more histidine and phenylalanine than R-RSM.

Two experiments were carried out, each on 1190 commercial broilers allocated to 14 pens on litter. In both experiments the birds were fed starter diets without RSM for the first three weeks. In the grower and finisher diets soyabean meal (SBM) was substituted, partially or totally, by R-RSM or HP-RSM.

In Experiment 1 control broilers were significantly ($P<0.01$) heavier than those from the experimental groups, and birds receiving R-RSM were heavier ($P<0.05$) on day 48 of life than those given HP-RSM. In Experiment 2 there were no significant differences between the weight of birds receiving SBM or RSM in the diets, however, those given HP-RSM were slightly lighter. In Experiment 2 chickens fed RSM had larger livers ($P<0.05$) and thyroids ($P<0.01$) than the control birds.

In both experiments feed conversion efficiency in RSM- fed groups was poorer than in control one, even when the available lysine level was not lower than in the control diet.

KEY WORDS: rapeseed meal, dehulling, glucosinolates, thyroid, broilers, chicken

INTRODUCTION

Rapeseed meal (RSM) is regarded as a valuable protein source for poultry because of its well-balanced amino acid composition. Moreover, RSM offers distinct economic advantages to countries where meal from locally grown rape seed can replace imported soyabean meal. Thanks to low glucosinolate (GLS) levels, double-low varieties of RSM can be used to a greater extent in poultry diets than previously. A relatively high level of crude fibre is now thought to be a bigger obstacle than other limiting factors. Although recently developed yellow-seeded „000" varieties have thinner seed coats (Slominski, 1993) and contain less lignin and polyphenols, they are not yet grown on a large scale. Attempts are, therefore, being made to increase the proportion of rapeseed meal in diets for monogastric animals by decreasing those components which limit the availability of nutrients.

According to a new technology, rape seed is peeled at the oil mill before or after oil extraction. In France a new method for peeling rape seed before oil extraction has been developed. As a result of using it, a meal containing 43% less fibre and 17% more protein was obtained (Baudet et al., 1988, cited by Chibowska, 1995). In Poland Żernicki (1980) attempted to peel seeds with compressed air in an HEF dehuller-separator. However, the efficiency of the dehulling process was small, with only 40% of the seeds being peeled in the first and 58% after the second passage. At the present stage of technology, peeling methods are troublesome and require the use of complex and expensive equipments. It is easier to remove the hulls from rapeseed meal than to peel seeds.

The idea was to divide RSM by mechanical segregation into 2 fractions: one with lower crude fibre and higher protein (HP-RSM) and another with a higher fibre and lower protein levels. The former fraction provide a good feed for poultry, while the latter may be used for ruminants.

The objective of the experiments was to compare the effect of substituting soyabean meal (SBM) by regular RSM or HP-RSM on the performance of broilers.

MATERIAL AND METHODS

Two batches of commercial double-low, brown-seeded rapeseed meal (RSM) were mechanically segregated by passing through a 0.5 mm sieve. The fraction named HP-RSM constituted about 1/3 of regular RSM by weight, had less crude fibre and higher protein level, but slightly more glucosinolates (GLS) than regular RSM (Tables 1 and 2).

Experiment I was carried out on 1190 Avian broilers kept on litter in 14 pens, each with 85 birds. During the first 3 weeks of life all birds were fed the same starter diet containing 22.5% crude protein (CP) and 12.3 MJ ME/kg. The main components of the diet were (%): maize, 35; wheat, 25 and soyabean meal, 26. At 21days of life all broilers were weighed and randomly allocated to 7 groups, two replicates (pens) in each. During the next three weeks the birds were fed isoprotein and isoenergetic grower diets containing three levels of R-RSM or HP-RSM, while

TABLE 1

Chemical analysis of soyabean meal, rapeseed meal and its high-protein fraction, % DM

Meal	Experiment	Dry matter	Ash	Crude protein	Ether extract	Crude fibre	N-free extractives
Soyabean	1	88.16	7.30	47.80	2.04	10.00	32.86
(SBM)	2	87.90	6.98	51.20	1.98	11.34	28.50
Regular rapeseed	1	86.96	7.72	38.87	3.70	18.08	31.63
(R-RSM)	2	88.69	7.69	38.90	2.99	15.69	33.83
High-protein rapeseed	1	86.29	8.30	45.22	1.84	14.60	30.04
(HP-RSM)	2	89.11	8.14	44.10	2.32	13.54	31.90

TABLE 2

Glucosinolate content of rapeseed meal and its high-protein fraction, μM/g deffated DM

RMS[1]	Experiment	Progoitrin	Gluco-napin	Gluco-brassicanapin	Gluco-napoleiferin	4-hydroxy-glucobrassicin	Total GLS
R-RSM	1	9.7	4.3	0.84	0.48	0.12	15.49
	2	6.4	2.8	0.47	0.23	0.07	9.99
HP-RSM	1	10.5	4.6	0.83	0.47	0.22	16.69
	2	7.5	3.3	0.58	0.34	0.10	11.86

[1] see Table 1

the control group was fed a diet with 20% SBM. During the final week three finisher diets were fed (Table 4). The dietary protein level was balanced by meat meal and meat-and-bone meal, the energy level by blended fat.

Experiment 2 was carried out on 1190 Starbro broilers allocated to 14 pens of 85 birds in each. Up to 21 days of life all broilers were fed a starter diet containing 21.5% CP and 12.3 MJ ME/kg, with (%): maize, 30; wheat, 29 and SBM, 27, as the main components. From 21 to 48 days of life 7 groups were fed grower diets containing 20% CP and 13.3 MJ ME/kg while other 7 groups were fed diets containing 18.5% CP and 12.5 MJ ME/kg (Table 5).

All broilers were individually weighed in Experiment 1 at 3, 6 and 7 weeks, in Experiment 2 at 3 and 7 weeks of age. At the end of the experiments the birds were checked for sex. Four males and four females of a weight close to the mean for the group and sex were chosen from each of seven groups in Experiment 1 and from ten groups in Experiment 2 for carcass analysis. During dissection fatty tissue was taken off if found on the breast muscle.

In RSM and HP-RSM dry matter, nitrogen, fat, ash and crude fibre were analyzed using standard methods (AOAC, 1990). The amino acid content, excluding tryptophan, was determined on a Carlo Erba automatic analyzer. Glucosinolate content was analyzed by HPLC according to the ISO-9167 method (1991).

The results were subjected to ANOVA (GLM) analysis (SAS Institute, 1985).

RESULTS

HP-RSMs contained more crude protein and less crude fibre than the RSM by 4-5 and 1-2.4 percentage units, respectively (Table 1). HP-RSM from the first batch contained slightly more crude protein and crude fibre but less crude fat than that from the second batch. Total glucosinolate level was slightly higher in HP-RSM than in RSM (Table 2).

In both batches HP-RSM protein contained less methionine and cystine while more histidine and phenylalanine than RSM (Table 3).

Experiment 1. Chickens receiving diets containing RSM were at 42 days of life significantly lighter ($P<0.01$) than birds fed the control diet, but there were no significant differences between birds fed diets with R-RSM or HP-RSM (Table 6). At the age of 48 days broilers offered R-RSM were heavier ($P<0.05$) than those fed diets with HP-RSM but lighter by 3-5%, respectively, than control ones.

TABLE 3

Amino acid content of the regular and HP fraction of rapeseed meal, g/16 g N

Amino acid	R-RSM[1] Experiment		HP-RSM[1] Experiment	
	1	2	1	2
Lys	5.85	5.60	5.99	5.44
Met	2.41	2.85	2.20	1.88
Cys	2.84	3.57	2.10	2.64
Thr	5.40	4.98	4.86	4.92
Val	5.36	4.92	5.42	5.02
Arg	5.95	6.19	6.62	5.74
Gly	5.80	5.38	5.50	5.45
Ser	4.47	4.77	4.17	4.73
His	2.80	2.77	3.48	3.83
Ile	4.00	3.73	4.66	3.84
Leu	7.18	7.45	7.79	7.39
Phe	4.66	4.24	5.13	5.56
Tyr	3.54	2.63	3.34	3.93

[1] see Table 1

TABLE 4

Composition of grower and finisher diets, % (Experiment 1)

Ingredients	Grower diets							Finisher diets		
	1	2	3	4	5	6	7	1	2	3
Ground wheat	25.4	18	20	21.5	21.8	22.2	22.7	57.5	50	53.2
Soyabean meal (44% CP)	20	–	5	10	–	4	7.5	12	–	–
R-RSM	–	24	18	12	–	–	–	–	18	–
HP-RSM	–	–	–	–	22	18	14	–	–	15.5
Meat meal (60% CP)	2.4	4.7	4	3.5	3.2	2.8	2.8	–	–	–
Meat-and-bone meal (42% CP)	4	4	4	4	4	4	4	3	3	2.5
Blended fat	5.5	7	6.5	6.5	6.5	6.5	6.5	5	6.5	6.3
ME (calculated), MJ/kg	12.77	12.71	12.69	12.79	12.80	12.82	12.86	12.77	12.64	12.81
Crude protein (analysed), %	19.39	19.77	19.86	19.72	19.17	19.31	19.30	16.37	16.86	16.58
Lysine, %	0.94	0.87	0.88	0.90	0.88	0.89	0.91	0.69	0.66	0.67
Lysine available*, %	0.83	0.70	0.70	0.72	0.70	0.71	0.73	0.55	0.53	0.54
Methionine+cystine, %	0.72	0.84	0.81	0.78	0.81	0.79	0.77	0.63	0.73	0.70
Crude fibre, %	3.97	5.75	5.31	4.85	4.87	4.73	4.55	3.74	5.29	4.51

additionally, grower diets contained 25% maize and 15% barley, finisher diets no maize and 20% barley

all diets contained 0.3% NaCl, 1% vitamin-mineral premix, 0.6% dicalcium phosphate and 0.6% limestone except G-1 (0.7%) and G-2 (0.5%) respectively

* calculated after Rhodimet Nutrition Guide (1993)

TABLE 5

Composition of grower and finisher diets, % (Experiment 2)

Diet	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Maize	28.2	28	30	30	28	30	33	30	35	35	37	30	30	38
Wheat	25.5	25	22.4	20.4	25.4	24.9	20.9	16.2	21.3	19.3	16.3	29.8	27.8	18.3
Barley	15	13	10	10	13	10	10	15	–	–	–	–	–	–
Soyabean meal	19	10	5	–	7.5	4	–	19	10	5	–	7	4	–
R-RSM	–	11	17	23	–	–	–	–	13	19	24	–	–	–
HP-RSM	–	–	–	–	13	17	21	–	–	–	–	12.5	17	22
Meat meal	2	2.6	3.5	4	2.5	3	3.5	4.9	5	5.5	6.5	5.5	5.5	6
Meat-and-bone meal	3.5	3.5	4	4	3.5	3.5	4	4.5	5	5	5	5	5	5
Blended fat	4	4.3	5.5	6	4.5	5	5	8	8.5	9	9	8	8.5	8.5
Dicalcium phosphate	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Limestone	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.5	0.5	0.5	0.5	0.5	0.5
NaCl	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2
Premix DKA-G	1	1	1	1	1	1	1	1	1	1	1	1	1	1
ME (calculated), MJ/kg	12.55	12.39	12.52	12.47	12.45	12.52	12.48	13.26	13.27	13.26	13.17	13.30	13.28	13.25
Crude protein (analysed), %	18.67	18.50	18.64	18.53	18.51	18.56	18.60	19.90	20.10	19.99	19.90	19.82	19.96	19.99
Lysine, %	0.80	0.83	0.87	0.89	0.82	0.83	0.85	0.89	0.94	0.96	0.98	0.90	0.92	0.94
Lysine available*, %	0.70	0.66	0.70	0.71	0.66	0.66	0.68	0.78	0.75	0.76	0.78	0.72	0.74	0.75
Methionine+cystine, %	0.70	0.77	0.81	0.83	0.77	0.79	0.81	0.78	0.81	0.85	0.88	0.79	0.82	0.85
Crude fibre, %	3.04	3.79	4.10	4.51	3.99	4.22	4.49	2.89	3.50	3.91	4.23	3.48	3.83	4.21

* calculated after Rhodimet Nutrition Guide (1993)

Feed conversion efficiency in groups fed diets containing RSM was poorer than in the control group in the grower period, but not in the finisher period (Table 6).

Carcasses of chickens receiving diets with R-RSM contained more breast muscle and less fat (P<0.01) than the control birds (Table 7). Relative liver weight of the birds fed diets with RSM or HP-RSM was not greater than that of control ones.

Experiment 2. Dietary protein level, type or level of meal had no significant effect on final body weight of chickens (Table 8). However, feed efficiency was better in the control groups than groups fed R-RSM or HP-RSM.

Birds fed diets with R-RSM or HP-RSM had larger livers (P<0.05), expressed as percent of carcass, than those of the control groups (Table 9). However, there were very small differences in liver weight between birds receiving 21-24% or 11-13% RSM (Table 9).

Relative weight of thyroid glands was much smaller in the control birds (8.4 mg/100g BW) than in broilers receiving 11-13% R-RSM (10 mg) or 23-24% R-RSM (12.8 mg). Statistically, highly significant differences were also observed between thyroid size of birds given R-RSM and HP-RSM (11.4 mg vs 13.2 mg/ 100 g BW).

TABLE 6

The mean body weight of broilers at 6 and 7 weeks of age and feed efficiency, kg feed/kg gain (Experiment 1)

Group	Dietary meal level	Body weight, g		Feed efficiency	
		42 days	48 days	22-42 days	42-48 days
1	20% SBM	1699^{A}	1987^{A}	2.18	3.10
2	24% R-RSM	1572	1930	2.31	3.08
3	18% R-RSM	1547	1901^{B}	2.33	3.06
4	12% R-RSM	1527	1931	2.30	3.01
5	22% HP-RSM	1526	1882^{B}	2.36	3.11
6	18% HP-RSM	1534	1920	2.35	3.09
7	14% HP-RSM	1529	1863^{B}	2.37	3.12
Pooled SEM		53.1	33.1		
		Probability			
Source of variation					
type of RSM		0.1988	0.0076		
sex		0.0001	0.0001		
interaction		0.9578	0.5268		
		Main effect means			
R-RSM		1548^{A}	1921^{a}		
HP-RSM		1530^{A}	1889^{b}		
Males		1698^{A}	2044^{A}		
Females		1449^{B}	1804^{B}		

^{ab} P<0.05; ^{AB} P<0.01

TABLE 7

Carcass yield, % of live body weight, and skin, muscles and fat content in carcass, % (Experiment 1)

Dietary meal and level, %	Carcass yield, %	Liver	Skin with subcutaneus fat	Breast muscles	Drumstick muscles	Abdominal fat pads
SBM, 20	72.1	3.20	11.7	18.8	9.6	4.7
R-RSM, 24	72.8	3.29	10.8	19.7	9.5	4.0
R-RSM, 18	73.7	2.89	10.2	20.7	9.6	4.3
R-RSM, 12	72.7	3.13	10.2	20.5	9.6	4.5
H-RSM, 22	73.1	3.12	10.3	19.5	9.9	4.6
H-RSM, 18	71.9	2.88	9.6	20.4	10.2	3.8
H-RSM, 14	71.8	3.42	10.0	19.6	9.5	4.1
Pooled SEM	0.52	0.14	0.32	0.55	0.26	0.19
			Main effect means			
SBM	72.06	3.20	11.70^{A}	18.85^{B}	9.63	4.71^{a}
R-RSM	73.11	3.10	10.40^{B}	20.30^{A}	9.57	4.27^{b}
HP-RSM	72.32	3.14	9.98^{B}	19.82^{AB}	9.91	4.17^{b}

^{ab} $P<0.05$; ^{AB} $P<0.01$

DISCUSSION

Sieving RSM to decrease the crude fibre content proved not to be a very efficient procedure. Although dark-seeded rape contains no more than 22-25% hulls by weight (Mitaru et al.,1983; Smulikowska et al., 1998), the HP-RSM fraction obtained by us constituted only 35% of the initial weight. In the experiment of Chibowska et al. (1993) sieving on 3 sieves with various mesh diameter resulted in achieving HP-fraction which constituted 50% of RSM. With regard to technological procedures, peeling before oil extraction may be more important. Fraction rich in hulls may be fed to ruminants (Keller et al., 1996).

In the first batch of HP-RSM, crude fibre decreased by 19% and in the second by 14%, while the protein level increased by 16 and 11%, respectively. In the experiment of Shires et al. (1983), quoted by Chibowska (1995) separation of hulls from RSM on sieves with a mesh diameter of 0.323 mm resulted in decrease of fibre content by 43%, but the amount of protein increased only by 8%. When separating RSM on a sieve with a mesh diameter of 0.4 mm Żernicki (1978) achieved a similar reduction of crude fibre level – from 15.6 to 9%, i.e. by 42%. In the experiment of Chibowska et al. (1993) the protein level increased from 36.2 to 42% DM, i.e. by 16%, while crude fibre decreased by 26% in the fraction which constituted 50% of RSM.

In the experiment of Seth and Clandinin (1973), the level of lysine in the low-hull fraction of Bronowski RSM was the same as in our experiment and did not

TABLE 8

Mean body weight of broilers at 48 days and feed efficiency, kg feed/kg gain (Experiment 2)

% of substitution SBM by RSM protein	Protein level in the diets, %			
	18.5	20.0	18.5	20.0
	Body weight, g		Feed efficiency	
SBM	1895	1950	2.27	2.15
R-RSM 100%	1882	1952	2.40	2.33
R-RSM 75%	1873	1925	2.47	2.35
R-RSM 50%	1916*	1921	2.45	2.27
HP-RSM 100%	1892	1860*	2.30	2.34
HP-RSM 75%	1870	1976	2.39	2.30
HP-RSM 50%	1869	1852*	2.46	2.40
Mean	1885	1918	2.39	2.30
Pooled SEM	24.8	32.6		
		Probability		
Source of variation				
protein level		0.0983		
type of RSM		0.0867		
level of RSM		0.4351		
sex		0.0001		
Interaction		NS		
	Main effect, means			
Protein level	1883	1912		
Type of meal				
SBM		1922		
R-RSM		1912		
HP-RSM		1884		
Level of RSM, %				
100		1897		
75		1911		
50		1884		
males		2044^{A}		
females		1765^{B}		

* differed from the other within a column at $P<0.05$, ^{AB} $P<0.01$

differ from the level in R-RSM. However, they found *B. campestris* and *B. napus* to contain significantly more lysine in the low-hull fraction than in regular RSM. The low-hull fraction separated from three varieties of RSM by Seth and Clandinin (1973) contained almost the same level of sulphur amino acids as regular RSM.

TABLE 9

Carcass yield, % of live body weight, thyroids (mg/100 g BW) and liver, skin, muscles and abdominal fat content in carcass, % (Experiment 2)

Meal level in the diet	Dietary crude protein, %	Carcass yield, %	Thyroid glands	Liver	Skin with subcutaneous fat[1]	Muscles breast	Muscles drumstick	Abdominal fat pads
19% SBM	18.5	72.7	8.1	2.51	9.81	22.13	8.92	2.22
19% SBM	20.0	70.7	8.7	2.43	9.92	22.80	13.35	2.04
23% R-RSM	18.5	69.3	12.9	2.90	9.17	22.12	9.71	1.98
24% R-RSM	20.0	70.5	12.7	2.78	10.15	21.26	9.61	2.24
21% HP-RSM	18.5	70.2	13.0	2.78	9.70	21.63	9.60	2.15
22% HP-RSM	20.0	69.8	14.6	2.72	9.92	23.11	9.62	2.32
11% R-RSM	18.5	70.5	8.9	2.81	9.80	22.89	9.68	2.31
13% R-RSM	20.0	68.9	11.1	2.66	9.68	20.92	9.97	1.75
13% HP-RSM	18.5	69.5	13.5	2.84	9.90	21.11	9.53	2.66
12.5%HP-RSM	20.0	69.2	11.6	2.48	9.91	21.60	10.11	2.11
Pooled SEM		0.50	1.0	0.12	0.35	0.50	0.30	0.26
				Main effect, means				
SBM		71.4^a	8.4^C	2.47^b	9.86	22.54	9.83	2.13
R-RSM		69.8^b	11.4^B	2.79^a	9.79	21.86	9.74	2.07
HP-RSM		69.9^b	13.2^A	2.72^a	9.89	22.01	9.79	2.30

[1] skin from the whole carcass except of the wings

means bearning superscript A or B differ significantly within a column, capital letters $P<0.01$, small letters $P<0.05$

Rape seeds contain aliphatic glucosinolates (progoitrin, gluconapin, glucobrassicanapin and gluconapoleiferin) and small amounts of indole type glucosinolates (4-OH-glucobrassicin). Vinyloxazolidinethione (VOT), the product of progoitrin hydrolysis, limits the uptake of iodine from blood and inhibits the reactions of thyrosine iodination resulting in hypothyroidism, while the indole derivatives inactivate liver enzymes.

In the first batch, HP-RSM contained 8% more GLS than regular RSM, and 16% more in the second batch. This is understandable, for the majority of GLS is found in the kernel, so dehulling results in an increased GLS concentration in the remaining fraction.

In the first batch of RSM the glucosinolate level (15.5 μM/g defatted DM) was similar to that found by Korol et al. (1994) in the Ceres variety. In the second batch it was lower (9.99 μM/g), similar to the level of aliphatic GLS (9 μM/g) in the experiment of Kinal et al. (1990). These levels of GLS are lower than the upper permissible content in double-low rapeseed meal, i.e. 20 μM/g defatted DM (Koreleski, 1993).

In the experiment of Kinal et al. (1990) the inclusion of 10% RSM in the starter and 15% in the grower diet resulted in an increase in thyroid weight from 9.5 in the control group to 18 mg/100g BW. In our experiment thyroids were much smaller even when broilers were offered grower diets containing up to 24% RSM. Smulikowska et al. (1998), when giving broilers 20% RSM containing 21 μM GLS/g, found that in 22-day-old cockerels the thyroid was only slightly heavier than in controls (8.4 vs 7.3 mg/100 g BW). Matsumoto and Akiba (1979) found that despite the enlargement of thyroid glands as a result of GLS intake, thyroid function in chickens was kept at a fairly good level.

Gawęcki et al. (1983) reported that various amounts of VOT and ITC consumed by birds gave a similar reaction and suggested that a strong negative reaction occurs when the intake threshold of these components has been exceeded. This is in agreement with the results of our experiment where no differences in broiler performance were found regardless of the level of RSM in the diet. Diets of high or moderate level of RSM had a similar effect on the liver size.

Because of lower digestibility of rapeseed meal protein and a slightly worse composition of exogenous amino acids, SBM was not replaced with RSM in the starter diets of our experiments. Early in life chickens grow very quickly and are particularly sensitive to feed quality.

In Experiment 1 the control diet contained 0.83% and the R-RMS or HP-RSM diets 0.70-0.73% digestible lysine calculated according to Rhodimet Nutrition Guide (1993). In Experiment 2 the content was 0.78 or 0.70% in the control diets and 0.78-0.66% in the R-RMS or HP-RSM diets, depending on the crude protein level of the diet. In Experiment 1 replacing SBM, partly or completely, with RSM had an adverse effect on body weight gains of chickens, possibly because of the insufficient amount of digestible lysine.

In Experiment 2 there were no differences between broilers receiving the control SBM diet or various levels of R-RSM, only those given HP-RSM were slightly lighter. In the experiment of Simbaya and Slominski (1992) growth of White Leghorn cockerels was not improved on dehulled canola meal relative to the regular meal from brown or yellow rape seed.

In the experiments of Smulikowska et al. (1991) substitution by weight of SBM with RSM decreased crude protein in the diet from 187 to 168 g/kg and the lysine level from 0.92 to 0.72% (0.76 vs 0.62% available lysine). As a result, the body weight of 4-week-old broilers was 21% lower and feed efficiency was 8% poorer.

Supplementing lysine up to 0.92% of the diet increased body weight and improved feed efficiency compared with the control group. In our experiments feed efficiency was not improved, even when the lysine level was elevated.

In the experiment of Koreleski et al. (1992) 8-week-old broilers fed grower/finisher diets containing 15% double-low RSM weighed over 170 g less than those from the control group. There was also a significant difference in FCR (2.54 vs 3.03) in the period of 22-56 days of age, however the diets were not isoenergetic.

Bouchardeau (1972) found that broilers fed diets with RSM were less fatty. Also in the experiment of Koreleski et al. (1992), carcasses of broilers fed a diet with 15% RSM had slightly less abdominal fat than those of the control birds (1.4 vs 2.5%). This is in agreement with the results achieved by us in Experiment 1, but in Experiment 2 broilers fed the RSM diet had as much fat as those fed SBM diets.

CONCLUSIONS

Substitution of SBM by regular RSM or its fraction with higher protein and lower fibre content did not decrease the weight gain of broiler chicken when the available lysine level was maintained in the diet. Feed conversion efficiency, however, was poorer.

The HP-fraction containing more glucosinolates led to a greater enlargement of thyroid glands than did regular RSM. There were no differences in liver size of broilers fed R-RSM or HP-RSM.

Despite a slight decrease in feed efficiency, rapeseed meal can be regarded as a good component of a grower diet. Of great significance is the much lower price of rapeseed meal compared to soyabean meal and the fact that RSM did not lower the quality of the carcass.

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STRESZCZENIE

Frakcja śruty rzepakowej 00 o podwyższonej zawartości białka w żywieniu kurcząt broilerów

Dwie partie handlowej poekstrakcyjnej śruty rzepakowej 00 rozdzielono na dwie frakcje na sicie o średnicy oczek 0,5 mm. Frakcja o cząstkach mniejszych niż 0,5 mm (HP-RSM) stanowiła około 35% materiału wyjściowego. Zawierała ona mniej włókna surowego o 14 i 19%, a więcej białka ogólnego o 16 i 11% i glukozynolanów o 8 i 19% (odpowiednio w 1 i 2 partii) niż wyjściowa śruta.

Przeprowadzono 2 doświadczenia, każde na 1190 kurczętach brojlerach rozmieszczonych w 14 kojcach po 85 ptaków w każdym. W obydwóch doświadczeniach przez pierwsze 3 tygodnie ptaki żywiono mieszanką starter bez śruty rzepakowej. W mieszankach grower i finiszer śrutę sojową zastępowano, częściowo lub całkowicie, śrutą rzepakową lub HP-RSM.

W doświadczeniu 1 w 48 dniu życia masa ciała kurcząt z grupy kontrolnej była największa ($P<0,01$), a kurcząt otrzymujących HP-RSM większa ($P<0,05$) niż kurcząt żywionych normalną śrutą rzepakową. W doświadczeniu 2 nie stwierdzono istotnych różnic w końcowej masie ciała kurcząt, lecz w grupie otrzymującej HP-RSM była ona najniższa. W doświadczeniu 2 masa wątroby i tarczycy kurcząt żywionych śrutą rzepakową lub HP-RSM była większa ($P<0,05$ i $P<0,01$) niż kurcząt kontrolnych.

W obydwóch doświadczeniach wykorzystanie paszy było gorsze w grupach żywionych śrutą rzepakową lub HP-RSM niż w grupie kontrolnej, nawet gdy zawartość lizyny dostępnej była podobna.