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Effect of different ratio of rapeseed cake in feed on production of hens and fatty acids content of egg yolks

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ABSTRACT

The main goal of this research was to establish the influence of 8% (PN-8) and 16% (PN-16) rapeseed cake in feed mixture on production of hens and fatty acids content of eggs yolk. 90 hens of Hrvatica strain have been used in period of 24^{ih} to 32th weeks of egg production. Hens have been sorted out in 30 cages, 3 of them in each cage. Hens from group PN-16 laid significantly (P<0.05) lighter eggs and had highest consumption of feed mixture/kg of eggs. The nutrition treatment had not clearly negative effect on average egg production during the investigation. The mortality of 10% in group PN-16 and 6.67% in group PN-8, points to the possible negative impact of rapeseed cakes on the health of hens. Feeding hens the diet with rapeseed cake decreased (P<0.05) SFA, increased PUFA n-3 and PUFA n-6 content of egg yolks and had positive effect (P<0.05) on PUFA n-6/PUFA n-3 ratio. Taking into consideration above mentioned, it can be concluded that the rapeseed cake can be recommended to be used in the portion of 8 % in feed mixture for Hrvatica laying hens.
(Keywords: rape seed oil-cake, laying hens, production, fatty acid, eggs)

INTRODUCTION

Rapeseed cake is a good source of crude protein, but the limiting factors in poultry nutrition is a high content of crude fibre and antinutritive components: glucosinolates, eruca acid and tannin (*Chibowska et al.,* 2000). *Campbell et al.* (2007) estimated that feeding hens with rapeseed cake did not affect the egg production and mortality of hens. Feeding hens the diet with ground rapeseed increased PUFA n-3 and PUFA n-6 content of egg yolks, and had positive effect on PUFA n-6:PUFA n-3 ratio (*Niemiec et al.,* 2002). The main goal of this research was to establish the influence of 8% (PN-8) and 16% (PN-16) rapeseed cake in feed mixtures on production of Hrvatica layers and fatty acids content of their egg yolks.

MATERIALS AND METHODS

While conducting the experiment, 90 hens of Hrvatica strain, have been used, in period of 24th to 32th weeks of egg production. Breeding of Hrvatica hen started at the beginning of 20th century and today is rearing in four strains (*Janječić et al.,* 2007). Hens have been sorted out in 30 cages, 3 of them in each cage. Ratio of rapeseed cake (rape seed cultivar Bristol) in feed mixtures was 0% (PN-0), 8% (PN-8) and 16% (PN-16). Each nutrition treatment had ten replicate. Chemical compositions of rapeseed cake and feed mixtures for hens are shown in *Table 1.*

Table 1

Chemical composition of rapeseed cake and feed mixtures for hens

Chemical composition, %	Rapeseed cake	PN-0	PN-8	PN-16
Moisture	6.48	11.70	11.26	11.30
Ash	6.93	9.23	10.48	10.46
Protein	30.31	16.94	16.66	16.96
Fat	7.70	5.18	6.01	6.11
Fibre	12.60	3.60	4.15	4.34
Nitrogen free extracts	35.98	53.35	51.44	51.10
Ca	1.02	2.31	2.66	2.55
P	1.27	0.75	0.67	0.65

During the investigation the average egg weight, average egg production, conversion of feed mixtures and mortality of hens were measured. Content of fatty acid of 30 samples of eggs yolk (10 of each treatment) were analysed. The dried lipid extract was methylated according to *Hartman and Lago* (1973). Fatty acid methyl esters were separated on a gas chromatograph (Philips, PU 4550) equipped with a split injector (100:1), fused silica capillary column (50m×0.25 mm i.d., 0.20 μm film thickness of polyethylene glycol (CP-SIL 88, Crompak, Netherlands), flame ionisation detector, and work station (Borwin, France). The fatty acids were identified by comparison of the retention times of the sample with those of the standards, and by co-chromatography. To verify the differences between the eggs yolk, the results for fatty acids were submitted to an analysis of variance (ANOVA) at the 5% level of confidence (*SAS,* 2007).

RESULTS AND DISCUSION

Production results of hens of Hrvatica strain are given in *Table 2.*

Table 2

Production results of Hrvatica layers during eight weeks of eksperiment

Production result	Treatment		
	PN-0	PN-8	PN-16
Average egg mass g	57.02[a]	57.34[a]	56.90[a]
Average egg production of hens, %	45.50	49.92	44.03
Consumption of feed mixture/ kg of egg mass	3.93[b]	3.96[b]	4.61[a]
Mortality, %	0	6.67	10

[a,b] $P<0.05$

Hens from group PN-16 laid significantly lighter ($P<0.05$) eggs ($P<0.05$) and had highest consumption of feed mixture/kg of eggs. The nutrition treatment had not clearly negative effect on average egg production during the investigation regarding mortality. The mortality of 10% in group PN-16 and 6.67% in group PN-8, points out the possible negative impact of rapeseed cakes on the health of hens. Fatty acid composition (grouped as SFA-saturated fatty acids, MUFA- mono-unsaturated fatty acids, PUFA poly-unsaturated fatty acids) of rapeseed cake, layer feed mixture and egg yolks are given in *Table 3.*

Table 3

Grouped fatty acid composition (% of total) of rapeseed cake, layer feed mixtures and egg yolks

Fatty acids	Rapeseed cake	Layers feed mixture			Eggs yolk		
		PN-0	PN-8	PN-16	PN-0	PN-8	PN-16
ΣSFA	13.27	26.44	25.52	25.49	35.03[a]	33.46[b]	33.72[b]
ΣMUFA	54.82	28.91	30.3	30.21	48.43	48.79	47.75
Σ PUFAn3	6.66	1.84	2.66	2.71	1.04	1.35	1.48
Σ PUFAn6	22.62	37.04	35.46	35.58	13.87	14.79	15.51
ΣSFA/ΣMUFA	0.24	0.91	0.84	0.84	0.72	0.69	0.71
Σ PUFAn6/Σ PUFAn3	3.40	20.13	13.33	13.13	13.34[a]	10.96[b]	10.48[b]

[a,b] $P<0.05$

Feeding hens the diet with rapeseed cake decreased ($P<0.05$) SFA, increased PUFA n-3 and PUFA n-6 content of egg yolks and had positive decreasing-effect ($P<0.05$) on PUFA n-6/PUFA n-3 ratio. This could be valid because the ratio of n-6/n-3 PUFA in human food should be as much as possible to approximately 1 (*Okuyama et al.,* 1997).

CONCLUSIONS

Taking into consideration above mentioned, it can be concluded that the rape seed oil-cake can be recommended to be used in the portion of 8% in feed mixtures for Hrvatica laying hens.

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