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EFFECT OF LIGHTING PROGRAM AND ENERGY LEVEL IN THE RATION ON THE SLAUGHTER TRAITS OF BROILERS

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Abstract: Investigations were carried out to assess the effect of lighting program and energy levels in the diet on carcass characteristics of broilers. The experiment was performed on chickens Cobb 500 hybrids for up to 42 days. The setting was reflected by the principle of two factorial experiments (2x2) at the 40 broiler carcasses of both sexes (10 per replications). The first factor was the lighting program where a group represented by the application of broiler chickens lighting 23L: 1D and group B of the regime 1. wk – 23L: 1D; 2. wk – 12L: 12D, 3. wk –14L: 10D; 4. wk - 16L: 8D; 5.wk –18L: 6D, 6. wk –20L: 4D. Another factor was the energy level where meals are in the "A" group were carcasses of broiler chickens fed diets with standard protein and energy in group "B" were the carcasses of chickens fed diets with high energy content to 0.40 ME MJ / kg compared the standard mixtures. Tests have shown that a lighting program and energy level as factors have no significant effect on carcass yield of broiler chickens, but significant differences ($p < 0.05$) emerged as the interaction Axb and Bxa combinations of the parameters “ready to roast" and "ready to grill". The amount of abdominal fat was significantly higher ($p < 0.05$) in group A and Axb combination compared to Bxa and Bxb. Share weight edible offal expressed as % of “carcass cut classic " was significantly higher ($p < 0.05$) in group B. The combination of Axb had a significantly lower proportion of edible offal compared to the combination of Bxa.

Key words: broiler, light, energy level, carcass traits

Introduction

Broiler chickens are usually grown on a continuous or nearly continuous program of lighting (23 L: 1 D) in order to increase food intake and their growth

(*Kampo and Davila, 2002*). The downside of this is the accumulation of fat in the carcasses, higher incidence of metabolic disorders, and increased occurrence of skeletal deformities *(Kristensen et al., 2006; Olanrewaju et al 2006; Onbasilar et al., 2007; Škrbić et al. 2009b, 2012)*. More research was realized in order to examine different light programs in combination with a protein content and density of the ration for fattening broiler chickens. Tests have shown that, depending on the applied program length lighting can positively and negatively affect the performance of broiler chickens and on carcass quality *(Onbasilar et al., 2007; Archer et al., 2009)*. In addition to continuous lighting there were programs with discontinuous and achemeral light (*Li et al., 2007; Škrbić et al., 2009a)* and a wide range of light intensity *(Blatchford. et al, 2009; Li, et al., 2007, 2010)*.

Diet composition as a factor also is essential for the majority of production parameters. For maximum production and good quality meat, broiler chickens must be provided optimum ratio of protein and energy content of the meal. High-density meals may increase the price of food *(Brickett et al., 2007; Kamran et al., 2008; Huang et al., 2009)*, excretion of nitrogen *(Bregendahl et al., 2002)*, deposition of fat and the incidence of metabolic disorders *(Nahashon et al., 2005)*. Most studies show that feeding high energy meal increases body weight but reduced FCR *(Kampo and Davila, 2002; Nahashon et al., 2005; Archer et al., 2009)*, and produces hulls better conformations *(Nahashon al, 2005; Brickette et al, 2007)*, but significantly higher content of abdominal fat *(Sikur et al, 2004; Fan et al., 2008)* compared with the low-energy diet. Some researchers suggest that portions of low density will result in lower FCR *(Wu et al., 2007; Fanatico et al., 2008)*, and has no effect on carcass yield, breast meat yield, thigh and abdominal fat *(Kamran et al., 2008)*. Little research has focused on the interaction of light and the energy levels of a meal on production performance and carcass quality of broilers *(Buys et al. 1998)*. Testing was done in order to determine the effect of the length of the light period and the level of energy in food to carcass yield, abdominal fat content and edible offal of broiler chickens.

Materials and methods

The experiment was performed on chickens Cobb 500 hybrids that were grown in the floor system of holding up to 42 days of age. The tests were carried out two factorial experiments (2x2) with five repetitions per treatment with 20 chicks in each replication. The setting of the experiment is given in the attached schedule.

Treatment	Level of factor
Program of screen: 23L: 1D - standard	A

Program of screen: I week – 23L: 1D; II – 12L: 12D, III – 14L: 10D; IV – 16L: 8D; V – 18L: 6D, VI – 20L: 4D	B
Food with standard facilities in protein and energy	a
Food with a heightened energy facilities in 12:50 MJ ME / kg of a mixture	b

During the test it has been applied a standard technology for fattening broiler chickens. From the start experiment all relevant production parameters were monitored. Chickens were fed *ad libitum*. Feeding chickens was with three types of mixtures; starter mixture to 14 days of age that contained 21.22% CP and 12.3 MJ / kg ME grower to 35 days with a crude protein content of 20.2 and 15.5 MJ / kg ME and finisher to this end, with 18.6% crude protein and 12.7 MJ / kg of ME. In treatment "b" of the existing content meal added with the oil to increase the energy value of a 0:50 MJ ME / kg diet. At the end of the trial with 6 weeks of age all birds were measured individually in groups to calculate the averages of groups and then from each experimental group was allocated 10 birds (5 male and 5 female) to investigate the slaughter characteristics. Prior to slaughter chickens starved 6 hours, then measured their body weight, then hand-slaughtered carcasses and processed using conventional method.

Data obtained by records of carcass yield parameters, content of abdominal fat and weight of edible offal (liver, heart, stomach, total edible offal) were processed by a computer program STATISTICA 12., identified as average values and variability measures. Performed an analysis of variance (ANOVA), and in the expression of statistical significance in the analysis of variance was applied Duncan test (Duncan Multiple Range Test) at the probability level $p \leq 0.05$.

Results and Discussion

Analysis of carcass yield (Table 1) shows that there were statistically significant differences among all treatments and interaction treatment of processing the bodies (KO, SP and SR), which is due to different average body weight of broiler chickens selected sacrificed. This is an indicator that the lighting program and energy content in the diet of chickens factors that significantly affected ($P < 0.05$) on carcass yield in broiler chickens. When it comes to yields as the relative value of the carcass yield, individual treatments (light programs and density meals) had no significant effect, but there were significant spills ($P < 0.05$) interacting with slate SP combination between Axa and BXA. Statistically significant differences ($P < 0.05$) were noted in the SR yield combinations of Axa on the one hand and BXA and BXB. The available literature in other studies no significant difference in the effect of lighting program yields, but is the impact of the energy value of meals *(Brickette et al., 2007; Blatchford et al., 2009; Huang et al., 2009).*

Table 1. Carcass yield and dressing percentage

Effect	Fact.	N	BW[1]	Carcass yield, g			Dressing percentage, %		
				KO	SP	SR	KO	SP	SR
Total		40	2129	1889.6	1756.93	1583.57	82.41	76.64	67.92
Light	A	20	2215	1982.5[b]	1849.1[b]	1672.2[b]	82.46	76.93	68.45
	B	20	2042	1796.7[a]	1664.8[a]	1494.9[a]	82.36	76.35	67.40
Density meal	a	20	2158	1935.5[b]	1800.7	1622.6	82.62	76.89	68.26
	b	20	2099	1843.7[a]	1713.1	1544.5	82.21	76.39	67.59
Light x Density meal	Axa	10	2210	2019.8[b]	1885.7[b]	1705.7[b]	83.09	77,61[b]	69.19[b]
	Axb	10	2220	1945.1[bc]	1812,4[bc]	1638.8[bc]	81.83	76.26	67.71
	Bxa	10	2106	1851.2[ac]	1715.8[ac]	1539.6[ac]	82.14	76,17[a]	67.33[a]
	Bxb	10	1979	1742.3[a]	1613.9[a]	1450.2[a]	82.58	76.53	67.46[a]

a-c, Means in the same row with different letters are significantly different (P<0.05) KO - hull conventional tillage; Cup - hull ready to roast; FR - hull ready to grill
[1]Body Weight

Light as a factor of the environment (Table 2) were statistically significant (P <0.05) to both the absolute and the relative value of fat in carcass yield of broilers, which were confirmed by other researchers (*Sikur et al, 2004; Fan et al. 2008*). It was expected that the level of energy in the diet significantly influence the content of abdominal fat in carcass however, in this study it has not been confirmed. The reason for this is certainly the high variability in density FAKRA meals ("a" and "b"). The research conducted was in accordance with the research of *Wu et al.,* (2007a), but in contrast to most other studies *(Nahashon al, 2005; Brickette et al, 2007; Fanatico et al., 2008)*. Combinations of AXB and BXA gave a statistically significant difference (P <0 05) in the content of abdominal fat in broiler carcasses.

Table 2. Abdominal fat and edible offal

Effect	Factor	N	KO[1]	Mass in g					The share weight of the hull KO,%				
				Abdo. fat	Liver	Heart	Stomach	Edible offal	Abdo. fat	Liver	Heart	Stomach	Edible offal
Total		40	1889	22	45	10	35	90	1.20	2.39	0.53	1.88	4.80
Light	A	20	1982	24[b]	45	10	35	90	1.24	2.27[a]	0.52	1.77[a]	4.55[a]
	B	20	1796	20	45	9	35	91	1.16	2.52[b]	0.55	2.00[b]	5.06[b]
Density meal	a	20	1935	21	46	10	36	92	1.11	2.39	0.53	1.88	4.79
	b	20	1843	23	44	9	34	88	1.30	2.39	0.54	1.88	4.81
Light x Density meal	Axa	10	2019	22	46	10	35	91	1.11	2.29	0.50	1.74	4.53
	Axb	10	1945	26[b]	43	10	34	89	1.38[b]	2.25[a]	0.54	1.79	4.58[a]
	Bxa	10	1851	20[a]	46	10	37	94	1.11[a]	2.50	0.56	2.02	5.08[b]
	Bxb	10	1742	21[a]	44	9	34	88	1.210	2.54[b]	0.54	1.97	5.05

a-b, Means in the same row with different letters are significantly different (P<0 05)
[1] Mass carcass (Traditionally dressed carcass)

Light program "B" had significantly greater relative weight of the liver, stomach and a relatively larger share of supply of edible offal (P <0.05). The available literature on the impact of the program lighting values for these parameters is confirmed. The interaction of light meals programs and density in combination AXB and BXB showed significant differences (P <0.05) in the relative weight of the liver and stomach, and combinations composed between AXB and BXA in bulk edible offal (Table 2). These relationships also available literature could not be confirmed nor denied.

Conclusion

Overall conclusion in the shortest is the length of the light in broilers has a significant effect (P <0.05) the absolute value of all the carcass yield of broilers tested because of differences in average body weight at the time of sacrificing chickens. The impact of the light program and meals density did not give significant effects on yields of broilers, but the interaction of the light program and meals density combined Axa in relation to the combination of parameter BXA yield of SP was significantly better (P <0.05). The same was the case with the combination of Axa in relation to combination BXA and BXB the parameters in SR (P <0.05). The combination of lighting program B was significantly lower content of abdominal fat in broiler carcasses in relation to the light program A (P <0.05) combinations of light programs and density of meals BXA and BXB had a significantly lower share of abdominal fat in broiler carcasses in relation to the combination of AXB (P<0.05) light program B influenced the broiler chickens have a relatively larger mass of the liver and stomach as edible offal compared to the light program A (P<0.05). Liver weight was significantly greater in the combination of factors in relation to the BXB bxb and edible offal weight of this combination compared to BXA (P <0.05).

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Uticaj svetlosnog programa i nivoa energije u obroku na klanična svojstva brojlera

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Rezime

Istraživanja su izvedena kako bi se procenio učinak svetlosnog programa i nivoa energije u hrani na klanična svojstva brojlerskih pilića. Ogled je izveden na pilićima Cobb 500 hibrida u trajanju do 42 dana. Postavka ogleda je bila po principu dvofaktorijalnog ogleda (2x2) na ukupno na 40 brojlerskih trupova oba pola (po 10 ponavljanja). Prvi faktor je bio program osvetljenja gde su grupu A predstavljali trupovi brojlera iz program osvetljenja 23S:1M i grupu B iz režima I ned.- 23S:1M; II – 12S:12M; III – 14S:10M; IV – 16S:8M; V – 18S:6M; VI – 20S:4M. Drugi faktor je bio energetski nivo obroka gde su u grupi "a" bili trupovi iz grupe brojlerskih pilića hranjenih smešama sa standardnim sadržajem proteina i energije i u grupi "b" bili trupovi pilića hranjeni smešama sa povećanim sadržajem energije za 0.40 ME MJ/kg u odnosu na standardne smeše. Žrtvovani pilići su nasumično odabrani iz ispitivanih grupa mase ± 1 std. dev. od proseka grupe. Ispitivanja su pokazala da program svetla i gustina obroka kao faktori nemaju značajnog uticaja na randmane klanja brojlerskih pilića, ali su se značajne razlike ($p < 0,05$) javile kao interakcija kombinacije Axb i Bxa za randmane SP i SR. Količina abdominalne masti bila je značajno veća ($p < 0,05$) grupe A i kombinacija Axb u odnosu na Bxa i Bxb. Udeo mase jetre, želuca i jestivih iznutrica izraženih u % mase trupa KO bio je statatistički značajno veći ($p < 0,05$) za grupu B. Kombinacija Axb imala je značajno manji udeo jestivih iznutrica u odnosu na kombinaciju Bxa.

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