

EFFECT OF FEEDING CORN DISTILLERS DRIED GRAINS WITH SOLUBLES ON PERFORMANCE, ABDOMINAL FAT CONTENT AND THE PECTORAL MUSCLE COLOR OF BROILER CHICKENS

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ABSTRACT

The aim was to attempt to effect a partial replacement of soybean meal (SBM) by corn distillers dried grains with solubles (DDGS) to the growth intensity, feed conversion, weight and percentage of abdominal fat from the carcass and breast muscle color by hybrid ROSS 308. Experimental period was from 9th the 35th days of age when chickens were fed the experimental feed mixture BR2 differing on volume of SBM and DDGS. Chickens were divided into 4 experimental groups with two repetitions according to the content of DDGS in feed mixture. Group K contained no DDGS, D1 contained 6%, D2 contained 12% and D3 contained 18% of DDGS. Until 23rd days of age statistically significant ($P < 0.05$) better grow chickens experimental groups D1, D2 and D3 with DDGS in the feed mixture in comparison with the control group. On the end of attempt had statistically significant ($P < 0.05$) higher weight chickens in groups with 6 and 12% DDGS in the feed mixture (2498.5 g and 2496.3 g) compared with control (2425.9 g). Between the groups was not significant difference in carcass weight or in weight and proportion of abdominal fat. Feeding DDGS had a statistically significant effect ($P < 0.05$) to the lightness value of meat when the control group was statistically significantly higher L^* value than in groups D1, D2 and D3.

Key words: broilers, distillers dried grains with solubles, growth intensity, abdominal fat,

INTRODUCTION

With increasing use crop production for biofuels is growing amount of co-products from these productions. Co-products are often utilizable as livestock feed. One of them is dried corn distillers, which are referred by abbreviation DDGS (dried grains with distillers solubles). DDGS is a co-product in ethanol production and it is mainly a source of nitrogen, also it has higher concentration of fat, minerals and fiber (Belyeu et al., 2004).

The aim was to attempt effect of partial replacement soybean meal (SBM) by DDGS in broiler chicken diet to the growth intensity, feed conversion, abdominal fat content and breast muscle color.

MATERIALS AND METHODS

The experiment was performed with males broilers chicken hybrid ROSS 308. Till 8th days of age all chickens were fed by complete feed mixture BR1 (starter). The experimental period was from the 9th to the 35th day and chickens were fed by the experimental feed mixture BR2 with different content of DDGS. Feed mixture were the same nutrients balance.

Males were divided into 4 experimental groups with two repetitions according to the DDGS content in feed mixture. Control group (C) did not contain DDGS, group D1 contained 6%, D2 12% and D3 18% of DDGS. Composition of the experimental feed mixture is shown in table 1. Males had ad-libitum access to feed. Water supply was available by nipple drinkers.

In the experiment was monitored growth intensity, feed conversion and health (mortality). The growth intensity was determined by individual chicken weighing in 9th, 16th, 23rd, 30th and 35th days of age. Mortality was recorded daily. Feed conversion was monitored by feed weighing for each group and repeated separately. 35th day of age ten males with same weight were selected from each group and these were observed abdominal fat content with the proportion of the carcass and breast muscle color.

Chickens weight in was characterized by mean and standard error of the mean. To detect statistical conclusive differences between means of groups was used single-factor analysis of variance (ANOVA) followed by testing the weight difference by Scheffe test. The carcass weight, proportion and weight of abdominal fat and breast muscle color was used Kruskal-Wallis single-factor analysis of variance with subsequent testing of minimum significant difference.

Table 1. Experimental feed mixture composition (%)

Component	C	D1	D2	D3
wheat	37,08	37,08	37,08	37,08
corn	27,9	23,65	19,27	16,16
soybean meal	27,82	25	22,25	19,2
DDGS	0	6	12	18
rapseed oil	4	5	6,1	6,1
L-lysine HCl	0,1	0,17	0,21	0,27
DL-methionin	0,2	0,2	0,19	0,19
calcite (CaCO ₃)	1,3	1,3	1,3	1,4
salt (NaCl)	0,25	0,25	0,25	0,25
monocalcium-phosphate	1,05	1,05	1,05	1,05
mineral premix	0,3	0,3	0,3	0,3

RESULTS AND DISCUSSION

Table 2 shows results of weighing at weekly intervals from 9th to the 35th day of age. At the beginning of the experiment, which was the 9th day of age chickens, males were divided into four groups so that between the groups was not statistically significant ($P < 0.05$) difference in their weight. To the 23rd days of age statistically significantly ($P < 0.05$) better grow had chickens experimental groups D1, D2 and D3 with DDGS in the diet compared with the control group. The following week there was a settlement monitoring weight between groups (no statistical difference in weight) and at the end of attempt chickens had statistically significant ($P < 0.05$) higher weight groups with chicks reached 6% and 12% DDGS in the diet (2498.5 g and 2496.3 g) compared with control (2425.9 g). The difference in weight between the group with the most intense growth (D1) and a group with the lowest growth (C) was 72.6 g. Similar results also came Lumpkins et al. (2004) and Światkiewicz and Koreleski (2008) who states that can be included in broilers feed mixture "grower" and "finisher" up to 12 to 15% DDGS without negative affect to broiler growth. On the contrary Dale and Batala (2003) in their results emphasize that level of 18% DDGS in feed mixtures for broilers adversely affected their final weight and feed conversion. Study of Liu et al. (2010) shows that the feed intake of broiler chickens with a mixture containing 20% DDGS negatively affected final weight as chicks aged 21st days and at the age of 42nd days. In contrast Wang et al. (2007) found that chickens nutrition mixtures containing from 5 to 25% of DDGS had no negative impact on the final weight of chickens at the age of 14th, 35th and 49th days, but increased intake and feed conversion in chickens fed mixture containing 25% DDGS. Growth curves of individual groups are shown in figure 1 where are the equations given growth curves for each group.

Table 2. Average chicken weight in experimental period (g)

Group	9 th day	16 th day	23 rd day	30 th day	35 th day
C	266,9 ± 1,52 ^a	598,6 ± 4,50 ^a	1161,7 ± 8,24 ^a	1902,5 ± 13,93 ^a	2425,9 ± 18,07 ^a
D1	264,6 ± 1,54 ^a	630,3 ± 4,10 ^b	1211,2 ± 8,35 ^b	1949,6 ± 13,15 ^a	2498,5 ± 16,88 ^b
D2	264,3 ± 1,54 ^a	631,6 ± 4,48 ^b	1217,2 ± 7,98 ^b	1911,5 ± 12,27 ^a	2496,3 ± 15,67 ^b
D3	264,8 ± 1,46 ^a	637,6 ± 4,06 ^b	1220,3 ± 7,95 ^b	1917,9 ± 11,58 ^a	2449,4 ± 15,12 ^{a,b}

Note: different superscripts (a, b, c) characterize statistically significant differences ($P < 0,05$)

Table n. 3 indicates feed conversion in individual experimental groups. Feed conversion was not statistically evaluated, because it is an average of two values. For groups with an income of a mixture containing DDGS was found to be lower feed conversion. Loar et al. (2009) in their results indicates that a group of chickens fed mixtures containing 8% DDGS was found to be lower conversion than the control group, which received feed mixture based on soybean meal which corresponds with the results of our experiment. Likewise as Table n. 4 shows lower mortality in experimental groups D2 and D3, Loar et al. (2009) reached to lower mortality at chickens group fed by 8% DDGS in their intake compared with control group fed by DDGS free diet.

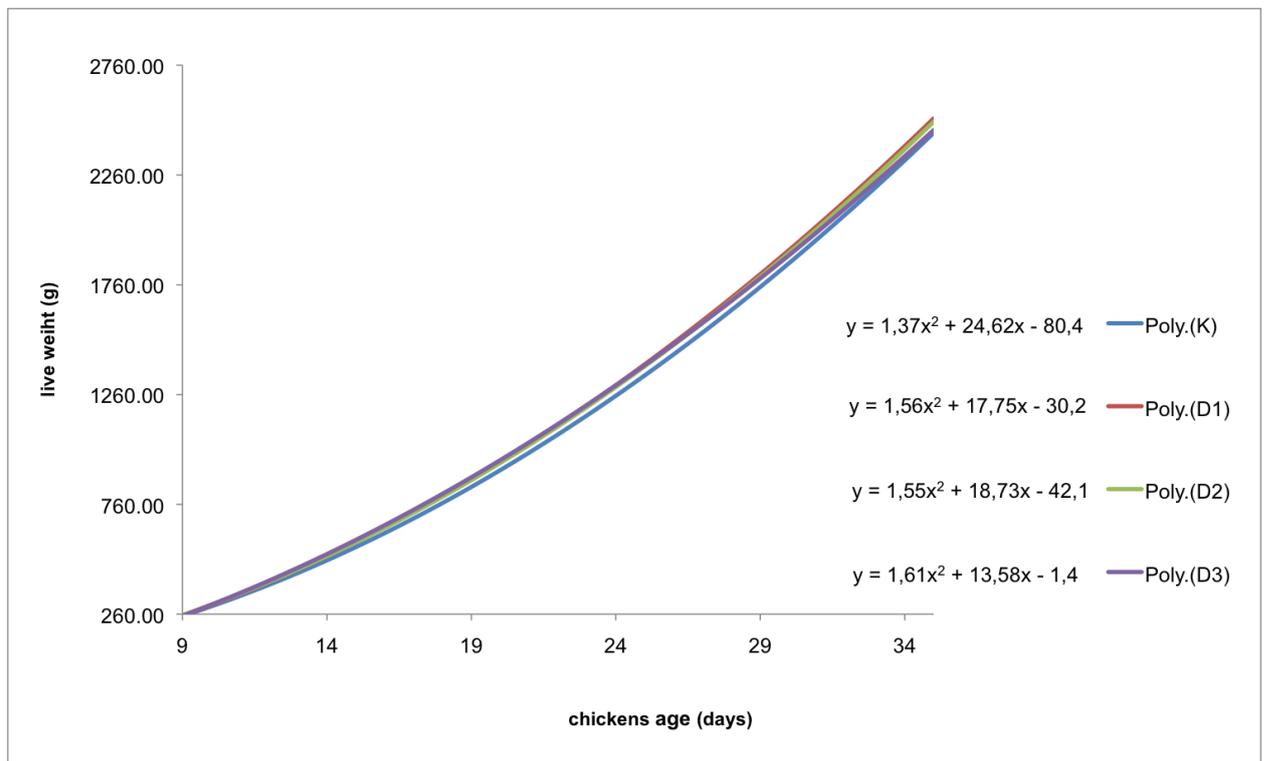
Table 3. Feed conversion for each group during the whole fattening period (kg/kg)

C	D1	D2	D3
1,68	1,66	1,59	1,65

Table 4. Mortality in experimental period from 9th to the 35th age of chicken (%)

K	D1	D2	D3
6	6	5	4

Figure 1. Growth curve of each experimental group



* growth curves are interpreted in the second polynomial degree

Table 5 presents the weight of abdominal fat and his proportion of the chicken carcass. Chickens were chosen in average weight with the minimum difference in live weight between groups. Between groups was not significant difference in carcass weight or in weight and proportion of abdominal fat, but we can say that chickens in groups fed mixtures containing DDGS achieve higher carcass weight as well as higher abdominal fat weight. These results were also Shim et al. (2011) when in his attempt statistically significantly higher abdominal fat weight achieved chickens feeding by mixture containing DDGS from 6%. Furthermore also in an attempt to come to the results that the presence of DDGS in feed mixtures fattened chickens had an effect on carcass weight increased but without statistical evidence. In Table 6 shows the pectoral muscle color is characterized by the parameters L, a * and b * which represent lightness (L), redness (a) and yellowness (b).

Table 5. Weight of abdominal fat and his proportion from the chicken carcass

	K	D1	D2	D3
Carcass weight (g)	1840 ± 16,9	1874± 12,8	1843± 15,8	1876± 15,3
Abdominal fat weight (g)	34,9 ± 2,16	33,8± 2,63	36,1± 1,55	37,2± 1,91
Proportion of abdominal fat (%)	1,9 ± 0,11	1,8± 0,14	2,0± 0,08	2,0± 0,10

Table 6. Effect of feeding DDGS to the breast muscle color

	K	D1	D2	D3
L*	58,8 ± 0,67 ^a	55,0 ± 1,41 ^b	54,9 ± 0,91 ^b	54,3 ± 0,97 ^b
a*	-1,09 ± 0,15	-0,62 ± 0,48	-0,68 ± 0,17	-0,67 ± 0,23
b*	10,1 ± 0,26	9,6 ± 0,3	10,1 ± 0,39	10,6 ± 0,31

Note: different superscripts (a, b, c) characterize statistically significant differences ($P < 0,05$)
L* - lightness, a* - redness, b* - yellowness

Feeding DDGS had a statistically significant effect ($P < 0,05$) the value of lightness meat. Control group had statistically significantly higher L* value than in groups D1, D2 and D3. Effect of DDGS in the chicken diet to the lightness of meat proved also Schilling et al. (2010), which observed the content of DDGS (6 to 24%) increased lightness meat value, but the results were not statistically conclusive difference. Similar results have also achieved Corzo et al. (2009), which represented 8% of the DDGS in the feed mixture come to the higher lightness value of breast muscle color compared with control group that were fed with feed mixture free of DDGS. These results were not statistically demonstrable differences. The other characteristics of meat color (a *, b *) did not affect feeding DDGS.

CONCLUSION

Feeding DDGS in the content from 6 to 12% in chicken diet statistically proven affect to the final weight of the chickens at the age of 35 days. DDGS in the diet had not a statistically significant effect on carcass weight, content and the proportion of abdominal fat. Lightness of meat (L *) was significantly lower value in the chicken groups fed by mixture containing DDGS (6, 12 and 18%).

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