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The Effect of Rations Containing Different Levels of Expanded Corn on Performance in Broilers

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ABSRACT

In this study was conducted to effect of expander corn supplementation of different levels to diet on performance in broilers. A 6-wk experiment, 390 unsexed day-old broiler chicks (Ross 308) was used in the experiment. Five treatments consisting of different expander corn levels (0, 25, 50, 75 and 100 %) were used with six replicates of seventy-eight chicks each treatment. Feed and water were supplied as ad libitum during the experiment. Different levels of expander corn addition to broilers diet were not significantly effect on body weight, body weight gain, feed intake, carcass weight and yield at the end of the experiment. Different levels of expander corn addition to broilers diet were significantly effect on feed conversion ratio. Feed conversion ratio was significantly decreased with dietary containing 75 and 100 % expander corn ($P<0.05$). The result of this study that containing to 100 % corn expander instead of corn to broiler diets can be used without adversely affecting performance.

1. Introduction

Heat processing of the cereal is commonly practiced in piglet diets to improve nutrient digestibility and productive performance (Medel et al., 2004; Mateos et al., 2006), but the information available on the influence of heat processing on chick growth is limited (Vukic´ Vranjes & Wenk, 1995; Moritz et al., 2005). Diet composition influences the development of the gastrointestinal tract and the utilization of nutrients in post hatch chicks (Noy & Sklan, 2002). Two nutritional alternatives proposed to improve gastrointestinal tract development and growth in young chicks are the use of easily digested ingredients (Noy & Sklan, 1999) and heat processing of the cereal portion of the diet (Gracia et al., 2003). The nutritive properties of starch vary considerably among the different cereals. Especially in oats, but also in barley and wheat, even native starch is easily digested. In contrast, maize and sorghum contains starch that is rather resistant to enzymatic digestion. Thus, the meaning and importance of starch gelatinisation differs depending on type of cereal to process. In countries where maize is an important feedstuff, expander treatment may be an efficient way to improve the nutritive value of starch both for monogastric animals. Past research has shown that corn-based diets made with expander technology increased broiler performance parameters compared with diets made with standard short-time thermal conditioning (Fancher el al., 1996; Wilson et al., 2001).

Some researchers have reported no or negative effect of diet conditioning on feed utilisation and growth performance in broiler chickens (Samarasinghe et al., 2000; Amornthewaphat et al., 2005; Zimonja et al., 2008). Amornthewaphat et al. (2005) found no improvement in feed intake, body weight gain and feed conversion ratio for broiler chickens fed steam pelleted diets compared to those fed mash control. Reduced feed intake and body weight gain were reported for broiler chickens fed steam pelleted diets based on oats or wheat, compared to the mash controls (Zimonja et al., 2008). Moreover, broilers fed extruded feed had lower live weight gains and improved feed conversion ratio compared to those fed pelleted diets (Vranjes et al., 1994).

The objectives of this study were to determine the effects of rations containing different levels of expanded corn on performance and carcass yield of broilers.

2. Materials and Methods

A 6-wk experiment, 390 unsexed day-old broiler chicks (Ross 308) was used in the experiment. Five treatments consisting of different expander corn levels (0, 25, 50, 75 and 100 %) were used with six replicates of seventy-eight chicks each treatment. The composition of experimental diets was showed in Table 1 and Table 2. Broilers were fed with starter diets from 1 to

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21 day of age and grower diets from 22 to 42 day of age. Starter and grower diets were formulated according to recommendation in the Ross management manual and NRC (1994). Water and feed were supplied ad libitum throughout the experiment.

Initial body weight of the birds was recorded at the beginning of the study. Body weight (BW) and feed intake (FI) were measured weekly, for each pen, and then body weight gain (BWG) per pen was calculated. Feed conversion ratio (FCR) was also calculated weekly as kg of FI per kg of BWG. Mortality was recorded daily. On the last day of the trial, five birds of mixed sex in each replicate were slaughtered for determination of carcass characteristics.

Data were analysed by a one-way analysis of variance for the level of expander corn in the diets (Minitab Reference Manual, Release 10.1). Those response variables resulting in a significant F value were further analysed using Duncan's multiple range test (Mstat C, 1995).

Table 1
Composition of experimental diets (Starter diets, 0-3 weeks)

	Rate of dietary expander corn (%)				
Ingredients	**0**	**25**	**50**	**75**	**100**
Corn	51.3	38.4	25.6	13.1	0
Expander corn	0	13.0	25.6	38.2	51.6
Soybean meal (% 46 CP)	38.80	38.40	38.20	37.64	37.20
Vegetable oil	6.10	6.40	6.76	7.00	7.12
Limestone	1.0	1.0	1.0	1.1	1.1
Di-calcium phosphate	2.1	2.1	2.1	2.2	2.2
Salt	0.3	0.3	0.3	0.3	0.3
Premix[1]	0.25	0.25	0.25	0.25	0.25
Lysine	0.02	0.02	0.04	0.06	0.08
Methionine	0.13	0.13	0.15	0.15	0.15
Total	***100***	***100***	***100***	***100***	***100***
Calculated nutrients					
Crude protein (%)	22.08	22.09	22.17	22.11	22.12
Metabolisable Enegy (kcal/kg)	3104	3111	3119	3119	3116
Calcium (%)	1.002	1.001	1.000	1.061	1.060
Available phosphorus (%)	0.501	0.501	0.500	0.517	0.516
Lysine (%)	1.307	1.294	1.307	1.310	1.317
Methionine (%)	0.483	0.479	0.496	0.491	0.487
Methionine + Cysteine (%)	0.847	0.841	0.858	0.850	0.844

[1]: Premix; per kg of diet: Vitamin A, 12.000 IU; Vitamin D_3, 1.500 IU; Vitamin E, 30 mg; Vitamin K, 5.0 mg; Vitamin B_1, 3.0 mg; Vitamin B2, 6.0 mg; Vitamin B6, 5.0 mg; Vitamin B12, 0.03 mg; Nicotinamid, 40.0 mg; Calcium D Panthotenate, 10.0 mg; Folic acid, 0.75 mg; D- Biotine, 0.075 mg; Choline chloride, 375 mg; Antioxidant, 10.0 mg.

Table 2
Compositions of experimental diets, % (Grower diets; 4-6 wk)

	Rate of dietary expander corn (%)				
Ingredients	**0**	**25**	**50**	**75**	**100**
Corn	55.50	42.00	28.08	14.00	0
Expander corn	0	14.00	28.00	42.18	56.80
Soybean meal (% 46 CP)	33.80	33.20	32.80	32.40	31.76
Vegetable oil	7	7.03	7.30	7.60	7.60
Limestone	1.2	1.2	1.2	1.2	1.2
Di-calcium phosphate	1.8	1.9	1.9	1.9	1.9
Salt	0.3	0.3	0.3	0.3	0.3
Premix[1]	0.25	0.25	0.25	0.25	0.25
Lysine	0.01	0.02	0.05	0.05	0.07
Methionine	0.10	0.10	0.12	0.12	0.12
Total	***100***	***100***	***100***	***100***	***100***
Calculated nutrients					
Crude protein (%)	20.04	20.01	20.04	20.07	20.03
Metabolisable Enegy (kcal/kg)	3209	3200	3204	3210	3202
Calcium (%)	1.01	1.01	1.01	1.01	1.01
Available phosphorus (%)	0.448	0.458	0.458	0.457	0.456
Lysine (%)	1.155	1.147	1.165	1.152	1.154
Methionine (%)	0.424	0.424	0.436	0.432	0.427
Methionine + Cysteine (%)	0.762	0.753	0.768	0.762	0.755

[1]: Premix; per kg of diet: Vitamin A, 12.000 IU; Vitamin D_3, 1.500 IU; Vitamin E, 30 mg; Vitamin K, 5.0 mg; Vitamin B_1, 3.0 mg; Vitamin B2, 6.0 mg; Vitamin B6, 5.0 mg; Vitamin B12, 0.03 mg; Nicotinamid, 40.0 mg; Calcium D Panthotenate, 10.0 mg; Folic acid, 0.75 mg; D- Biotine, 0.075 mg; Choline chloride, 375 mg; Antioxidant, 10.0 mg.

3. Results and Discussion

Dietary expander corn levels had no significantly effect on body weight (BW), body weight gain (BWG), feed intake (FI), carcass weight and yield, but significantly effect on feed conversion ratio (FCR) in broilers (Table 3). Feed conversion ratio was significantly decreased with dietary expander corn supplementation ($P<0.05$). The results of the present study are similar to those reported by Vranjes et al. (1994); broilers fed extruded feed had improved FCR compared to those fed pelleted diets. Amornthewaphat et al. (2005) found no improvement in FI, BWG and FCR for broiler chickens fed steam pelleted diets compared to those fed mash control. Their results indicated that this addition to weight gain and feed conversion in poultry can be improved if the extruded corn would be pelleted. Ljubojević et al. (2011) reported that extrusion of corn had no effect on the performance (BW and FCR) of broilers, so it was not expected that extrusion could achieve better production effects. Previous research on the effects of extrusion on the performance of poultry have been inconsistent results that Milošević et al. (2007); extrusion of corn meal has significantly affected the improvement of production performance of broiler chickens. During the extrusion process occur nutritional changes which may be significant for the quality of extruded feed. Starch in grains is also an important binding agent in steam-pelleted and extruded feeds (Jovanović et al., 2009). Extrusion process can reduce the availability of non-starch ingredients in corn. Moisture content of diets may also influence feed intake (Moritz et al., 2001). Milošević et al. (2011) reported that influence of corn meal and its technological processed form (extrude) on dressing process of cooling carcasses is evident, because of the small number of repetitions per group, and high variability within the group, the differences between the groups were not statistically significant.

Table 3
Effect of different levels of expander corn addition to diets on performance in broilers from 0 to 6 weeks

Performance parameters	Rate of Expander corn in diets, %				
	0	25	50	75	100
Body weight, (g/broiler)	2666.3±37.60	2644.2±72.87	2706.8±59.52	2830.6±95.04	2791.1±43.80
Body weight gain, (g/broiler)	2624.8±37.40	2603.9±72.83	2665.4±59.20	2790.2±94.18	2749.9±43.40
Feed intake, (g/broiler)	4412.3±41.31	4302.2±94.06	4381.3±88.01	4476.5±110.96	4455.8±64.87
Feed conversion ratio, (feed, g /gain, g)	1.68±0.015[a]	1.65±0.028[ab]	1.64±0.008[ab]	1.61±0.017[b]	1.62±0.014[b]
Carcass weight, (g/broiler)	2004.7±27.88	1989.1±53.52	2002.3±48.91	2127.6±54.13	2102.0±23.23
Carcass yield, %	75.19±0.31	75.24±0.45	73.96±0.37	75.27±0.69	75.36±0.77

[a, b]: Values in row is statistically different; $P<0.05$

In this study results that supplemental expander corn in broiler diet was not expected achieve better production effects. However, containing to 100 % corn expander instead of corn to broiler diets can be used without adversely affecting performance.

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