

The effect of breed, gender, protein content of the starter diet and litter material on the performances of broilers

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Abstract

A lot of factors have their influence on the zootechnical performances of broilers. There are e.g. some indications that young broilers have very high protein/amino acid needs during the starter phase, being much higher than standard feed formulations (Lippens and Huyghebaert, 2004). A trial was done to investigate if breed, gender, protein content of the starter and litter material have an influence on the growth performances of broiler chickens.

Birds were fed a high (23.7 % CP, lysine_{ad} = 13.0 g/kg) or a standard protein diet (19.9 % CP, lysine_{ad} = 10.5 g/kg) from 1-10 days of age. In the grower and finisher phase, all birds were fed the same grower and finisher diet. Results show a significant higher body weight at 10 days of age for the birds fed the high protein diet (+7.0 % against the standard diet). Also feed conversion (1-10 days) was significantly improved (-8.4 %). These effects were similar for both breeds and both genders (no significant interaction with diet). At 42 days of age, in absolute values, final body weights of the birds fed a high protein starter were higher but differences were no longer statistically different. Only for female broilers of breed B, an improvement of the feed conversion due to increased protein content in the starter was realised (significant interaction). Feed intake was significantly higher for the high protein fed broilers (+ 1.4 %). In the period 1-28 days of age, significant higher growth rates were found for the birds on straw compared to wood shavings. Differences, however, disappeared at 42 days of age.

Introduction

The growth rate of broilers can be influenced by a lot of factors. For the farmer, it is very important to know the growth potential of his birds and the effect of different (environmental) factors. One factor of high potential to improve the growth rate of broilers is increasing the protein/amino acid concentration of the starter diet. On the other hand, due to environmental reasons, it is not desirable to increase the protein content of a diet considerably. Indeed, zootechnical performances might increase but more nitrogen (surplus) will enter the environment. It is however interesting to know if an increase in protein content in the starter phase has sufficient impact on the growth to have a significant effect on the overall zootechnical performances. As total protein intake at the starter phase is only minor compared to the protein intake of the entire growth period, the negative effect on the environment of an increased protein intake in the starter phase will only be limited.

The current trial was conducted to understand the effect of gender, starter protein content and litter material on the growth performances of two different, commercial broiler breeds.

Materials and Methods

A 4-factorial, block designed experiment was set up with 1608 broiler chicks. All diets were formulated with wheat as the main cereal. A high or standard protein starter diet was fed from 0 to 10 days of age. The high protein diet consisted of 237.0 g CP/kg (lysine_{ad} = 13.0 g/kg) and the standard protein diet of 198.5 g CP/kg (lysine_{ad} = 10.5 g/kg). Amino acids were formulated according to the ideal amino acid profile (Mack et al., 1999). Both starters had an energy content of 11.90 MEn/kg. All birds received the same grower (208.5 g CP/kg and 12.27 MEn/kg) and finisher diet (203.5 g CP/kg and 12.46 MEn/kg) from 11-28 and 29-42 days of age, respectively. Cycostat 6.6 % (500 gram/ton) (33 ppm Robenidine) and Clinacox (200 g/ton) (1 ppm Diclazuril) were used in the starter and grower diet, respectively, in order

to prevent coccidiosis. No growth promoter was used. The trial consisted of the following treatments: breed (2) x gender (male/female) x diet (high/standard protein starter) x litter material (finally cutted straw/wood shavings) x 3 replicates. There were 32 males or 35 females per pen. Each pen had an available surface of 2.1 m². Mash feed and water were available for ad libitum consumption. The lighting programme was 21L:3D and a standard temperature schedule was used.

Results and Discussion

Results are summarized in Table 1. Effects of gender were as expected, as male broilers grew faster and more efficient compared to the female broilers. Differences between males and females were more pronounced within the A-breed compared to the B-breed (significant interaction between breed and gender). However, these differences became less pronounced at the end of the trial.

A significant effect of protein content on growth performances was found for the period 1-10 days of age. Mean body weight at day 10 of the broilers fed the high protein diet was 7 % higher compared to the standard protein diet. Also feed conversion was significantly improved by protein content of the diet (- 8.4 %). No significant difference in feed intake was found in this starter period. At 42 days of age, in absolute values, final body weights of the birds fed a high protein starter were higher (+1.1 %), but differences were no longer statistically different. A significant interaction was found between breed, gender and diet for feed conversion (1-42 days of age, cf. figure). It seems that only for female broilers of breed B, an improvement of the feed conversion due to increased protein content in the starter was realised. Overall feed intake was significantly higher for the high protein fed broilers (+ 1.4 %). Mortality+culling-% was significantly lower for the birds fed the high protein diet (1.6 against 4.0 %; $p=0.045$). More research is needed to consider this as a treatment-effect.

Litter material had a near to significant effect ($p=0.069$) on mean body weight at 10 days of age. Broilers reared on straw litter had a 2 % higher body weight. This had to do with a more efficient feed conversion of these birds (-2.2 %). Feed intake was not changed by litter material. Also during the grower phase (11-28 days of age), growth rate of the birds reared on the straw, was significantly higher compared to the growth rate of the birds reared on the wood shavings (+ 3.5 %) (results not shown). However, during the finisher period (29-42 days of age), birds on wood shavings showed some compensatory growth (3.2 % higher growth rate compared to the birds on straw), so mean final body weights on both litter materials were equal. Also for total feed intake (1-42 days of age) a significant interaction was found (breed x gender x litter; cf. Figure 1). It shows that male birds of the breed B had a lower feed intake when reared on wood shavings. The reason for this finding is not clear.

Conclusions

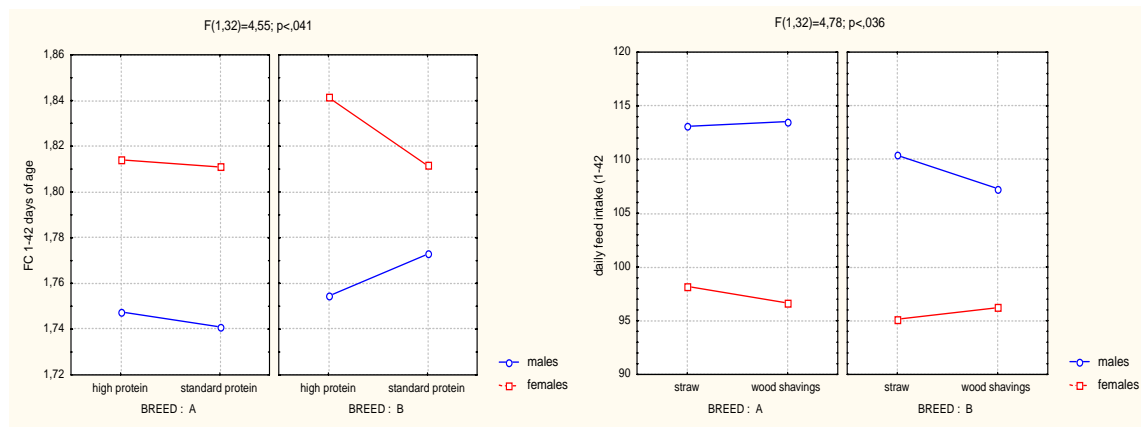
Feeding a high protein diet in the starter phase improves zootechnical performances although differences were no longer significant at 42 days of age. Except for feed conversion, both breeds and both sexes reacted in the same way on the increased protein content of the diet. Whether these minor improvements in zootechnical performances are economically interesting, depends on differences in feed prices (high and standard protein diet) and bird prices. However, margins are in the current trial that small, that the higher costs for the high protein starter in many cases will not be compensated for by the minor increase in final body weight. Some more trials however should be run with the current set-up to confirm the findings.

Wood shavings induced some retarded growth rates during the first 4 weeks of the trial. However, due to a compensatory growth phase in the finishing period no effect on final body weights were found at 42 days of age.

Table 1: Effect of treatments on performances of broiler chickens

	BW-1d g	BW-10 d g	Daily feed intake g/a/d 0-10 d	Feed conversion 0-10 d	BW-42 d g	Daily feed Intake g/a/d 1-42 d	Feed conversion 1-42 d
Anova(1)							
Breed (n=2)	0.000	0.000	0.000	0.402	0.000	0.000	0.010
Gender (n=2)	0.012	0.000	0.000	0.182	0.000	0.000	0.000
Diet (n=2)	0.909	0.000	0.456	0.000	0.145	0.049	0.388
Litter (n=2)	0.574	0.069	0.953	0.067	0.847	0.273	0.094
Sign. Interactions							
Breed x Gender	0.001	0.020	0.049	-	0.039	-	-
BreedxGenderxLitter	-	-	-	-	-	0.036	-
BreedxGenderxDiet	-	-	-	-	-	-	0.041
LSD m.r. test							
Breed - Gender							
A males	50.0 ^a	274 ^a	29.3 ^a	1.316	2779 ^a	113.3 ^a	1.744 ^a
A females	48.7 ^b	253 ^b	27.5 ^b	1.348	2306 ^c	97.4 ^c	1.813 ^c
B males	44.0 ^c	246 ^c	26.4 ^c	1.312	2637 ^b	108.8 ^b	1.764 ^b
B females	44.2 ^c	238 ^d	25.6 ^d	1.324	2245 ^d	95.7 ^c	1.826 ^c
Diet							
High protein	46.7	261 ^a	27.1	1.267 ^a	2505	104.5 ^a	1.789
Standard protein	46.7	244 ^b	27.3	1.383 ^b	2478	103.1 ^b	1.784
Litter							
Straw	46.8	255	27.2	1.310	2493	104.2	1.792
Wood shavings	46.7	250	27.2	1.340	2490	103.4	1.781
Overall SEM	0.4	3	0.2	0.012	34	1.1	0.006

Figure 1: Interaction between breed, gender and diet on FC (1-42 days of age) and interaction between breed, gender and litter on daily feed intake (1-42 days of age)



References

- LIPPENS, M. and HUYGHEBAERT, G. (2004) Are prestarters justifiable in broiler production? In Proceedings: XXII World's Poultry Congress, Istanbul, Turkey, June 8-13: 346.
- MACK,S., BERCOVICI, D., DE GROOTE, G., LECLERCQ, B., LIPPENS, M., PACK, M., SCHUTTE, J.B. and VAN CAUWENBERGHE, S. (1999). Ideal amino acid profile and dietary lysine specification for broiler chickens of 20 to 40 days of age. *British Poultry Science*. **40**: 257-265.