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THE ADDITION OF A NUTRITIONAL EMULSIFIER IMPROVES BROILER PERFORMANCE IN AN ENERGY DILUTED DIET

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Abstract

Emulsifiers are used to enhance the fat digestibility and by consequence to improve the feed conversion ratio due to the enhanced dietary MEn content. In a three-phase production trial two emulsifiers, E484 (Excential Energy Plus, 350g/T) and E481 (1000 g/T), were added on top of a negative control (NC) diet. The decrease of energy (0.42 MJ MEn/kg) in the NC diet was induced by exchanging 2.14 % fat for 2.14 % wheat in the positive control (PC) diet. Meanwhile, the addition of the synthetic amino acids was adapted in order to obtain diets with the same content of digestible amino acids. Each treatment consisted of 6 replicates with 30 male Ross 308 broilers. Birds fed the emulsifier diets reached the same final bodyweight (between 2,550 – 2,569 g) as the PC birds but had a significant ($P<0.01$) higher bodyweight than NC birds (2,417g). Effects on both BWG as FCR were most pronounced in the first 4 weeks of the trial. FCR of both emulsifier supplemented diets was 4.7% better ($P<0.05$) than those fed the NC-diet. For the overall period (0-39 d), the FCR was significantly ($P<0.05$) different and amounted 1.553; 1.651; 1.620 and 1.612 for the PC, NC, E484 and E481 emulsifier supplemented diets, respectively. The results demonstrated that the addition of the tested emulsifiers enhanced the performances of broilers but could not fully compensate the energy dilution of 0.42 MJ MEn/kg.

Keywords: broiler, energy, fat, digestibility, emulsifier

Introduction

Energy is a major cost component in broiler diets. Due to its high energy density, fats and oils are important energy sources in feed formulation. Improving the energy efficiency of these raw materials is of high interest from an economical point of view. Nutritional emulsifiers can be used to improve fat digestibility and thus improve the energy efficiency (Maertens et al, 2013). The objective of the trial was to evaluate the effect of 2 emulsifiers on the production performances of broilers. For this goal a negative control (NC) diet (with 0.42 lower energy content than the PC diet) was formulated and supplemented with one of the two test emulsifiers.

Material and Methods

A total of 720 one day old, male broiler chicks (Ross 308) were used in this trial. The birds were housed in the poultry experimental facility of ILVO (Animal Sciences Unit, Section Small Stock Husbandry, Merelbeke, Belgium). A randomised block design was used, with in total 6 blocks of 4 pens and 30 birds per pen. The floor was covered with fresh wood shavings and no additional filling or cleaning of the floor was necessary during the trial.

The experiment consisted of 4 treatments. Treatment 1 was a positive control (PC) diet, formulated with a metabolizable energy content of 11.8, 12.2 and 12.5 MJ/kg for starter, grower and finisher diet, respectively. Treatment 2 was the negative control diet and formulated with 0.42 MJ/kg (100 kcal) lower energy content, compared to PC. In treatment 3, the NC diet was supplemented with emulsifier I (E484, Excential Energy Plus, 350g/T) and in treatment 4 the NC diet was supplemented with emulsifier II (E481, 1000g/T). The chosen inclusion levels were based on practical applied dosages and in accordance with the advice dosage of the supplier. Diets used were wheat-soybean meal based with animal fat as added fat source. Total fat in PC was 7.42%, 8.16% and 8.95% in starter, grower and finisher respectively. The reduction in energy in NC was induced by exchanging 2,14% fat for 2.14% wheat. Meanwhile, the addition of the synthetic amino acids was adapted in order to obtain diets with the same content of digestible amino acids. A three-phase feeding scheme was applied with a starter period of 12 days followed by a grower diet between 12 and 28 days of age and a finisher between 28 and 39 days of age. The diets were prepared at the Institute's feed milling facilities. Feed was provided *ad libitum* as mash and drinking water was provided *ad libitum* by drink belts.

Data were submitted to a two-factorial variance analysis with treatment as factor and block as random factor.

Results

Bodyweight of the birds, body weight gain and feed conversion ratio's for period 0-28 and 0-39 days are presented in Table 2. Already at 12 days of age birds of both emulsifier added diets had a significant higher bodyweight then PC birds (data not shown). At day 28 and at the end of the trial, birds on the emulsifier diets had a significant higher weight than NC birds while at 39 days their weight was equal as birds fed the PC diet.

Table 1: Bodyweight (BW), Body weight gain (BWG) and Feed Conversion ratio (FCR) for period 0-28d and 0-39d

	BW		***BWG***		***FCR***	
	D28	D39	D0-28	D0-39	D0-28	D0-39
Pos Control	1396^{ab}	2557^{a}	48,3^{ab}	64,4^{a}	1,456^{a}	1,553^{a}
Neg Control	1324^{b}	2417^{b}	45,7^{b}	60,8^{b}	1,574^{b}	1,651^{c}
Neg Cont + emulsifier I	1435^{a}	2550^{a}	49,6^{a}	64,2^{a}	1,500^{a}	1,620^{b}
Neg Cont + emulsifier II	1447^{a}	2569^{a}	50,1^{a}	64,7^{a}	1,500^{a}	1,612^{b}

a,b: means in the same column with a different letter are significantly different (P<0.05).

During the grower period as well as in the finisher period, birds fed PC diet had a significant lower FCR compared to NC. However, the addition of both emulsifiers improved the FCR significantly compared with the NC diet. For the grower period (0-28d) the FCR of both emulsfier diets was statistically not different from PC. The overall FCR (d 0-39) of the positive control group was 98 points (P<0.05) lower than the negative control group. The gap in energy between the PC and NC diet was not fully compensated by the addition of the emulsifiers. However, both emulsfiers had a significant positive effect on the overall FCR and induced an average improvement of 2.1%.

Conclusions

The addition of both emulsifiers resulted in a comparable body weight gain (BWG) as observed in PC birds, while BWG was significantly improved (on average 6%) compared to the NC diet. The difference in energy content between PC and NC was clearly demonstrated by the significant different FCR. This gap was partly filled by the addition of the emulsifiers, both having a more favorable (P<0.05) FCR than the NC birds (2,1% improvement of FCR on average). However, the difference with the PC diet still remained significant. This indicates that a positive effect of 100 kcal (0,42 MJ)/Kg due to the addition of the emulsifier is overestimated. Both emulsifiers resulted in the same improvement in BWG and FCR, however emulsifier I (Excential Energy Plus) was more efficient in terms of dosing (350g/T) compared to emulsifier II (1000g/T).

The results indicate that the tested emulsifiers can improve energy efficiency in broiler diets and result in a significant better FCR, especially in the starter and grower period. The estimated energy upgrade under the tested diet composition is less then 100kcal. The practical application of this trial is that it shows a tool to improve feed efficiency that may lead to lower feed costs and more sustainable broiler production.

Literature

MAERTENS, L., L. SEGERS, M. ROVERS, A van der AA, S. LELEU, 2013: The effect of different emulsifiers on fat and energy digestibility in broilers *Proc. Eur. Symp. Poult. Nutr.* **19:** PP V-86.