

Energy is a major dietary cost component for high performing animals. Due to its high energy density, fats and oils are important energy sources in feed formulation. Improving the energy efficiency of these raw materials can result in feed cost savings.

Nutritional emulsifier

Bile salts are natural emulsifiers. The monoglycerides that are formed in the intestine after hydrolysis of the fat also act as emulsifiers. Nevertheless, the capacity of these natural emulsifiers can be a limiting factor for fat digestion. Young animals have a limited production of bile salts and therefore fat digestibility is limited in the early stage of life. Apart from this, the characteristics of the dietary fat and the amount of added fat can restrict the digestibility, also in older animals. Different

characteristics of the fat explain the differences in digestibility. In general, saturated fatty acids (mostly found in animal fat) are digested less easily compared to unsaturated fatty acids (like in vegetable oils). High levels of free fatty acids limit the digestibility. The use of a nutritional emulsifier is an effective tool to improve the fat digestibility. Obviously, the positive effect of adding such emulsifiers is more pronounced for lower digestible fats, but also in high digestible fats (like soybean oil) very positive effects can be observed.

Importance of hydrophilic-lipophylic balance

Hydrophilic-lipophylic balance (HLB) is a parameter to choose the optimal emulsifier for every specific application. An emulsifier with a low HLB is more fat soluble (lipophilic) and an emulsifier with

a high HLB is more water soluble (hydrophilic). Due to the fact that an animal consumes around twice as much water as feed, the intestine is a very watery environment. The goal of a nutritional emulsifier is to optimise the emulsification and micelle forming in the intestine and therefore an emulsifier with a high HLB (hydrophilic) is most preferred.

Trail design

Several published trials have shown the benefits of a nutritional emulsifier. In order to understand the effect more in detail, an extensive research project in broilers was undertaken as part of a PhD program in a cooperation between the Federal University of Lavras in Brazil and Orffa. A total of three trials were undertaken to investigate the effect of the emulsifier Excential Energy Plus on nutrient digestibility and ▷

Nutritional emulsifier in broiler diets saves energy and feed costs



Nutritional emulsifiers can be used to enhance fat digestibility and thus improve the energy efficiency, resulting in lower feed costs and also contributing to a more sustainable animal production, explains MARC ROVERS*.

Table 1 : Apparent digestibility coefficients for dry matter, crude protein and crude fat (%) for periods 35-42 days of age.

Oil level	Dry matter			Crude protein			Crude fat		
	Control	Emul	p value	Control	Emul	p value	Control	Emul	p value
0%	73.27	73.88	0.5063	62.59	61.65	0.4035	77.84	78.44	0.5698
1.50%	74.30	75.84	0.0974	64.08	66.03	0.0877	83.40	84.46	0.3130
3%	73.96	75.75	0.0535	65.55	65.23	0.7743	85.75	87.61	0.0818
4.50%	74.14	76.31	0.0210	66.32	67.91	0.1591	87.54	89.15	0.1303
6%	72.38	74.34	0.0355	64.00	64.11	0.9242	89.09	90.96	0.0803
CV (%)	2.12			2.98			2.11		
Average	73.61	75.22	0.0002	64.51	64.98	0.3440	84.72	86.12	0.0043

Figure 1: Apparent metabolisable energy (AMEn) in diets with increasing soybean oil inclusions, with and without emulsifier for period d35-42 (*p<0.05).

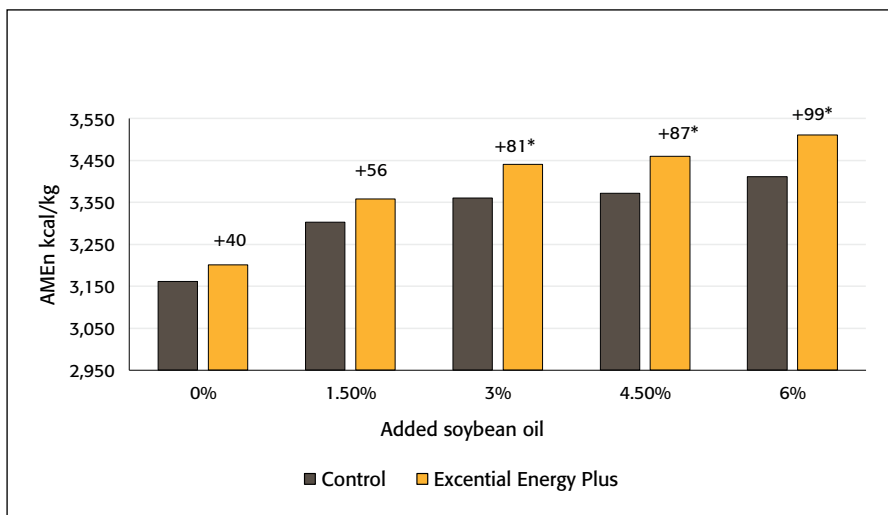
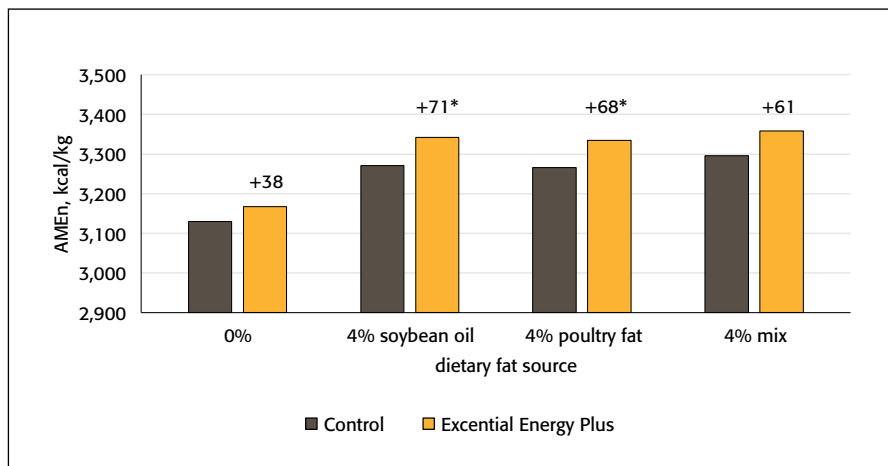


Figure 2: Apparent metabolisable energy (AMEn) in diets with different fat sources, with and without emulsifier for period d14-21 (*p<0.05).



was done in two basal diets (different diet compositions). Also a set up with two types of oil (soybean oil and poultry fat) was made to evaluate effect of fat source. The nutrient digestibility and metabolisable energy (AMEn) were analysed for young (14-21d) and older birds (35-42d), based on method of total excreta collection.

Results

Apparent metabolisable energy

The results showed that the emulsifier significantly improved dry matter and fat digestibility and this resulted in a higher metabolisable energy (AMEn) both for the young birds as well as for the older birds (data for old birds shown in Table 1 and Figure 1).

The additional trials showed that there was no effect of diet composition. In both diet types (vegetable diet and diets with animal by-products) comparable positive effects of the emulsifier were obtained. From the comparison between soybean oil and poultry fat it could be concluded that the emulsifier was effective on both fat sources (Figure 2).

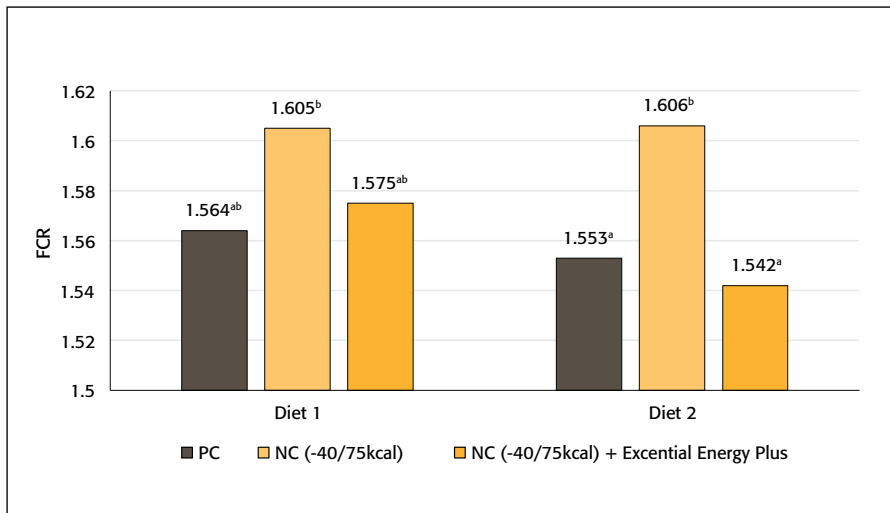
Feed conversion ratio

As a follow up to the metabolism trials, a performance trial was conducted to validate the obtained energy upgrades. As positive control, a basal feed program was formulated with a practical fat and energy level. The starter diet contained 2% soybean oil and the finisher diet contained 4% soybean oil. A negative control was formulated with a lower

metabolisable energy in broilers. Fat digestibility can be influenced by different variables and these were taken into account in the set up. The amount of fat and the type of fat are important variables, as well as the

age of the animal. To investigate the effect of inclusion level of fat, diets were formulated with increasing level of soybean oil (0%, 1.5%, 3%, 4.5% and 6%). Every level of oil was tested with or without emulsifier and this

Figure 3: Feed conversion ratio for positive control (PC), negative control (-40 kcal in starter and -75kcal in grower) and negative control + emulsifier groups (d1-42).



energy content. The energy content of the starter diet was reduced by 40 kcal/kg and the finisher diet was reduced by 75 kcal. These energy reductions were based on the obtained results in the metabolism trial and were reached by reducing soybean oil inclusions. As third treatment the negative control was supplemented with the emulsifier to

evaluate if the energy reduction could be compensated. This trial design was performed with two different diet compositions, diet 1 based on solely vegetable raw materials (corn/SBM) and diet 2 based on corn, SBM and meat and bone meal. The results are shown in Figure 3.

As expected, the energy reduction in the negative control diets resulted

in less efficient growth, as shown by higher feed conversions (Figure 3). The addition of the emulsifier was able to compensate the energy reduction and recovered the feed conversion back to the level of the positive control. The diets with the reduced energy were formulated with less soybean oil and therefore had a significantly lower formulation cost (around USD6/tonne lower). This trial work confirms that the addition of the emulsifier could be a practical tool for broiler nutritionists to lower feed costs.

Conclusion

The tested emulsifier improved digestibility of dry matter and fat and also improved metabolisable energy (AMEn) in broiler diets. This gives nutritionists the opportunity to formulate diets with a lower energy level, without compromising bird performance, resulting in lower feed costs and more sustainable animal production. *Ap*

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