



Intelligent emulsifier addition to broiler feed formulations to improve FCR

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Increasing awareness of poultry production's environmental impact, implies the industry must look for strategies to improve its sustainability, including reducing raw material use through improved feed conversion (FCR). One established approach is the use of absorption enhancers based on lysolecithins to improve lipid digestion and nutrient absorption, improving the rate and extent of emulsification in the gizzard of birds. However, *in vitro* digestion research in humans showed significant improvements in fat digestibility when preparing oil-in-water (O/W) emulsions prior to ingestion. Therefore, the present research aimed to evaluate the impact of a pre-prepared O/W emulsion versus separate oil and absorption enhancer additions to broiler feed on fat digestibility and FCR. Diets were prepared containing oil and a commercially available absorption enhancer (LEX) separately (SEP) or prepared as a O/W emulsion (O/W). The *in vivo* performance trial showed a significant improvement in FCR from 1.59-1.64 to 1.34-1.40 over the course of three weeks from feed formulations containing oil and LEX separately (SEP) to feed containing the O/W emulsion (O/W). The largest improvements in FCR were gained in the first week from 2.83-2.88 to 1.56-1.67, respectively. However, the digestibility trials did not show significant differences in fat digestibility. Additionally, complementary *in vitro* digestion of the diets was performed using an adapted *in vitro* digestion protocol simulating the grower broiler gastrointestinal tract. These *in vitro* digestions enable mechanistic insights into the digestion process by assessing the digestion kinetics (i.e. rate and extent). While no significant differences were present between the extents of fat digestibility of the diets, digestion kinetics showed significant differences. Their sigmoidal behavior showed significantly shorter lag phases in diets containing more LEX and/or an emulsion instead of the separate ingredients. Alongside fat digestibility, also *in vitro* protein and starch digestibility were assessed. Results showed different digestion behaviors in both fat and protein digestion in diets containing no emulsifiers, thereby indicating interactions between these two macronutrients, which were thought to occur less as the result of emulsifiers being present. Therefore, this study showed that the addition of O/W emulsions to feed formulations affects macronutrient digestion kinetics, thereby presumably improving the FCR.