

Improving gut health and performance with lower digestible protein diets

The search for alternative protein sources in feedstuffs is a field of research that is gaining considerable attention. For example, soy bean meal (SBM) and fish meal are easily digestible and have traditionally been the main sources of proteins in poultry diets.

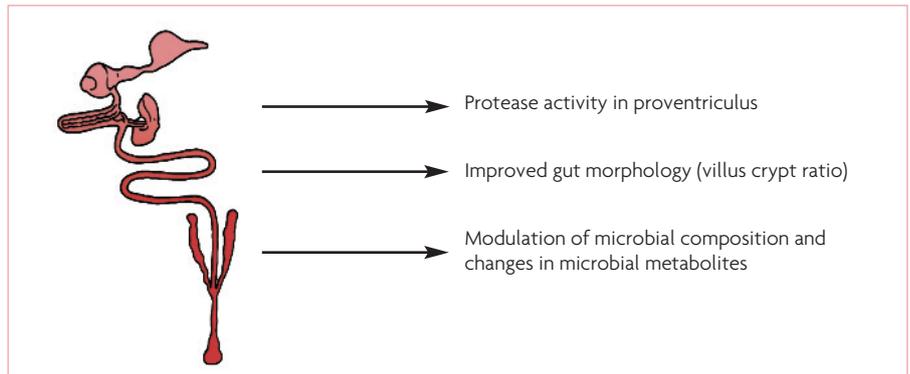
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However, this is likely to change in the future. The world population is growing and the demand for animal products is increasing but, at the same time, prices for these protein meals are volatile.

Moreover, their accessibility is expected to decline with an increasing demand for more highly digestible diet ingredients to be used for human consumption rather than for inclusion in animal diets.

The drive to continuously improve poultry production in a way that is both profitable and sustainable will therefore fuel the evaluation of other protein sources that are more economical.

However, these alternatives are likely to be less digestible, which will have a negative impact on animal performance. Not only will their lower digestibility result in reduced ileal uptake of amino acids, but also in more proteins reaching the hindgut. There, they will be used as a substrate for proteolytic fermentation, which can result



Overview of some potential mechanisms underlying the effect of Adimix Precision along the gastrointestinal tract.

in the production of harmful compounds that will compromise intestinal integrity and function.

Research studies

To explore the effects of less digestible protein sources on broiler production and to evaluate the potential of different feeding strategies to mitigate their negative impact on performance, several studies were set up at Wageningen University.

In one particular study an experiment was set up in which birds were fed a poorly digestible diet based on rapeseed meal (RSM). The impact of the following interventions was then evaluated: diet structure (coarse or fine), fermentable energy level (high or low) and

supplementation of a coated butyrate product (2kg/T Adimix Precision, Nutriad).

The choice for the latter treatment had to do with the fact that butyrate is described as having multifarious benefits associated with improved intestinal health and function, which are dependent on the specific location of butyrate release in the digestive tract of the animal.

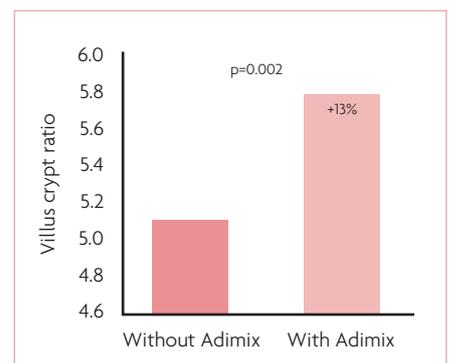
The butyrate product used in this study is characterised by a precision delivery functionality, meaning that butyrate will be delivered throughout the entire gastrointestinal tract. The study showed that feeding birds a diet that was based on RSM instead of SBM resulted in poorer performance and reduced intestinal health. However, when the RSM diet was

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Fig. 1. Performance of challenged birds after 14 and 34 days.



Fig. 2. Histomorphological measurements of the duodenum.



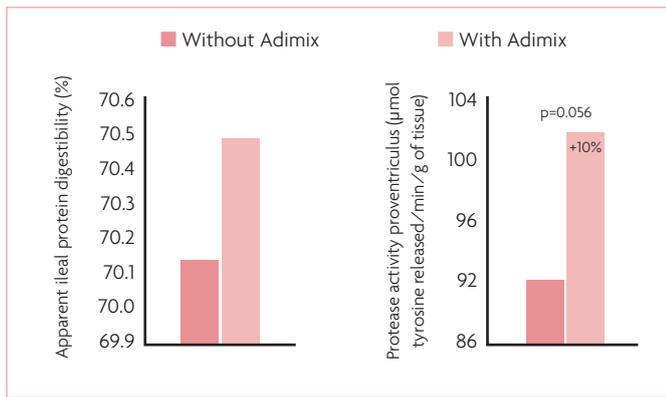


Fig. 3. Digestive measurements.

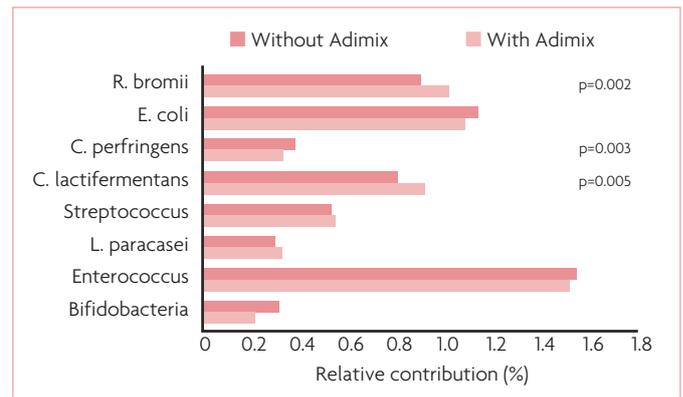


Fig. 4. Caecal microbial analysis.

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supplemented with Adimix Precision, body weight gain and FCR improved significantly after 14 days (Fig. 1). Remarkably, these differences could already be observed at the end of the starter phase.

Additional analyses provided insights on the underlying mechanisms along the entire gastro-intestinal tract possibly underlying these results. Greater duodenal villus height over crypt depth ratio as observed in birds from the Adimix Precision group, are in agreement with an improved intestinal health and function (Fig. 2).

A trend for higher apparent ileal protein digestibility and gastric protease activity in

Adimix Precision-supplemented birds suggest an increased digestive capacity (Fig. 3). Moreover, shifts in microbial composition might be indicative for a healthier microbial ecology (Fig. 4): Adimix Precision was associated with higher levels of *Clostridium lactifermentans* and *Ruminococcus bromii*, which are beneficial commensals involved in the metabolism of a wide range of organic molecules such as carbohydrates, amino acids, amines and organic acids. At the same time, the levels of potentially pathogenic *Clostridium perfringens* was reduced.

A positive outcome was also observed when the diet was coarser, such as an

increased gizzard size and function, which is associated with a decrease in pH, a longer feed retention time in the foregut and an enhanced ileal protein digestibility; some of these effects were further enhanced when this strategy was combined with Adimix Precision supplementation. In conclusion, the negative effects of a strong feed challenge could be partly counterbalanced in the young animal by the supplementation of Adimix Precision. The precision delivery butyrate release of this product is reflected by the gut health improving effects along the entire gastro-intestinal tract.

This resulted in improved performance of broilers throughout their life. ■