

# Optimal enzyme dose for wheat? Check the feed value first?

**Accurately predicting the feed quality of wheat has long been a challenge to poultry feed producers. Wheat quality prediction using near infrared spectroscopy enables feed producers to rapidly and cost effectively measure wheat quality at the feed mill.**

By Milan Hruby

As a result of research showing that the variability in the feed value of grain is a contributory factor to variable bird performance, Danisco Animal Nutrition has developed a two-stage grain analysis and enzyme dose optimisation service. Named Avicheck, the service provides broiler feed producers with an accurate laboratory analysis of the feed value of the grain to be used in broiler diets. Based upon the laboratory measurement of grain feed value, a computer model then calculates the optimum enzyme dose rate required to maximise the economic returns from enzyme use.

Harnessing the power of near infrared spectroscopy (NIRS), an NIRS-based wheat quality prediction service (AviNIR) was developed. This enables feed producers to measure the feed value of the grain at the feed mill instead of sending samples to the laboratory, allowing a more rapid means of accurately

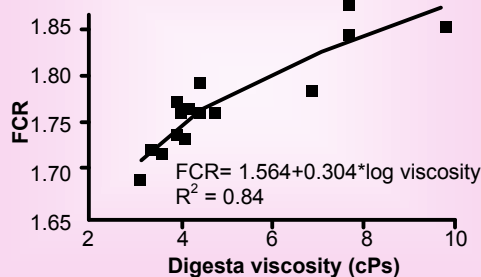
Wheat quality for broilers is variable, but determining the viscosity potential helps to maximise response to enzyme addition.

assessing wheat quality. With new season wheat coming onto the market, a rapid evaluation of wheat quality is particularly beneficial as feeding value can differ markedly when compared with that from the previous season.

Higher grain viscosity levels are associated with poorer quality grains, expressed as lower AME. As grain viscosity increases, bird performance declines, expressed as increased FCR (Figure 1). In wheat-based diets, adding specific enzymes (xylanases) to the feed provides an effective means of reducing intestinal viscosity by partially breaking down the soluble non-starch polysaccharides in the wheat. Viscosity is therefore a key indicator of grain feeding value, unlike classic measures of quality such as starch and protein content, specific weight or 1000 kernel weight, which do not correlate closely with bird performance and are poor indicators of grain feeding value.

Accurate and timely evaluation of the nutritive value of cereal grains is especially crucial because the grain

**Figure 1 - Digesta viscosity is closely correlated to broiler performance (Barrier-Guillot *et al.*, 1997)**



## Maximise energy release

The new AViNIR grain analysis system works on a similar principle to the laboratory analysis by measuring the grain's viscosity. Extensive research has demonstrated that differences in digesta viscosity, caused by soluble non-starch polysaccharides, correlate closely with the apparent metabolisable energy (AME) content of the grain and consequently broiler performance.

component of the diet can contribute up to 60% of the total energy content.

Manufacturers of poultry feed can then manage grain variability in a way that will achieve consistent bird performance while helping to maximise profitability.

### Laboratory service

Feed manufacturers can send representative samples of grain to Danisco's laboratory, where the viscosity of the grain is measured using a wet chemistry method developed by Danisco themselves. The grain viscosity measured in the laboratory correlates closely to that which would be induced in the bird's gut if the same sample of grain were fed (Figure 2). Combining the laboratory measurement and other dietary parameters such as the amount of grain in the diet and the feed and enzyme costs, the Avicheck computer model is used to estimate the optimum enzyme dose required to maximise economic return.

The service is particularly useful where wheat is the principle grain used in broiler feeds, because a number of factors influence the viscosity levels, including harvest year, country of origin, wheat variety, growth and harvest conditions.

### High accuracy feeding

For feed producers who have suitable NIRS equipment, the recent development of AviNIR now provides a quick and low cost alternative to the wet chemistry laboratory method to measure wheat quality. On average, the standard deviation between the original wet chemistry method used to determine wheat viscosity and the AviNIR system is 1.3cPs. As the standard deviation between replicates in the Avicheck wet chemistry method is 0.9cPs, the result obtained by NIRS is considered to be very good (Figure 3).

In summary, viscosity is one of the main factors contributing to differences in the nutritive value of wheat and other similar cereal grains (barley, oats, triticale and rye). Avicheck has proved an invaluable tool for determining the optimum enzyme dose according to cereal grain quality used in broiler feed. The increase in NIRS use by the feed industry allows feed producers to quickly and cost effectively measure wheat quality in their feed mill using AviNIR.

## Viscosity variation in action

The variability in wheat viscosity levels can be illustrated clearly using global data from the Avicheck wheat analysis database compiled from the 2000 and 2001 harvests. Whilst the average viscosity levels for wheat were similar between the two harvest years, there were significant differences in the range of viscosity levels.

Whereas in 2000, the viscosity levels ranged from 2.8 - 60.9cPs, the analysis of samples from the 2001 harvest showed a viscosity range of 3.3 - 31.0cPs (Table 1).

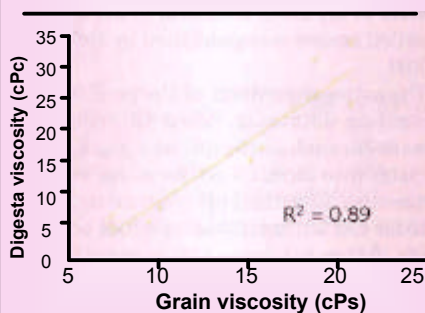
Assuming a broiler diet is formulated to contain wheat from the 2001 harvest. In practice, the wheat could have a viscosity value as high as 31 cPs or as low as 3.3cPs. A broiler diet containing wheat with a viscosity of 31 cPs would require 52% more enzyme than a diet containing the lower viscosity (3.2cPs) to achieve the same level of broiler performance.

**Table 1 – Global wheat viscosity levels**

Harvest year	Mean	Min	Max	Number of samples
1996	7.2	2.6	50.9	232
1997	8.2	2.6	35.5	1209
1998	6.6	1.7	32.2	1533
1999	9.1	3.2	40.9	1739
2000	10.1	2.8	60.9	1991
2001	10.3	3.3	31.0	1383

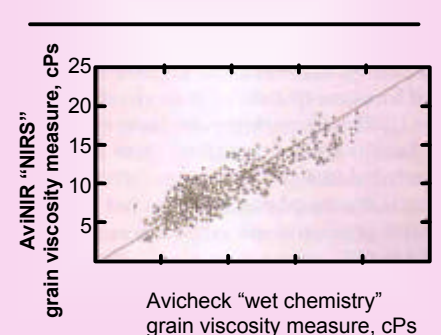
Source: Danisco Animal Nutrition

**Figure 2 - Correlation between digesta viscosity and grain viscosity**



Source: Danisco Animal Nutrition database

**Figure 3 - Wheat viscosity correlation between wet chemistry (Avicheck) and NIRS calibration (AviNIR)**



**Keywords:** Avicheck, Avizyme 1100, Avizyme 1110, Avizyme 1200, Avizyme 1210, Avizyme 1202, Avizyme 1300, Avizyme 1302, Avizyme 1310, Digesta viscosity, NIR, AviNIR, Extract viscosity, Ileal, AME, Wheat, New crop, Variability, Uniformity, Xylanase

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