Selecting xylanases for consistent performance improvements

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Pelleting feed for poultry unequivocally benefits animal performance by improving feed intake, increasing nutrient digestibility, reducing feed wastage and reducing microbial contamination.

Pelleting conditions vary dramatically across the globe and between feed mills, with conditioning temperatures ranging from 70-95˚C or even higher and conditioning times from as low as 10 seconds to several minutes.

Because of the global demand for salmonella-free diets, poultry producers are now applying higher pelleting temperatures to better sterilise feed.

Higher pelleting temperatures can also improve pellet quality and increase feed mill throughput.

Although conditioning and pelleting can improve the digestibility of some nutrients and thereby positively affect the performance of animals, consideration should also be given to the potential pitfalls related to pelleting feed, particularly at higher temperatures. Thermolabile vitamins, exogenous feed enzymes and some key amino acids such as lysine can be particularly affected by pelleting.

Published literature shows that, when feed is processed at high temperatures, losses in potency of vitamins and in the activity of enzymes can be as high as 50% when compared with the mash counterpart. Therefore, some of the performance and financial benefits of pelleting feed can be easily lost.

To the feed producer, one FCR point is increasingly becoming more expensive. Year on year, genetic improvement delivers around 1 FCR point.

In today's competitive environment, in order to protect potential profit gains, opportunities for performance losses in the production process need to be minimised (see Fig. 1).

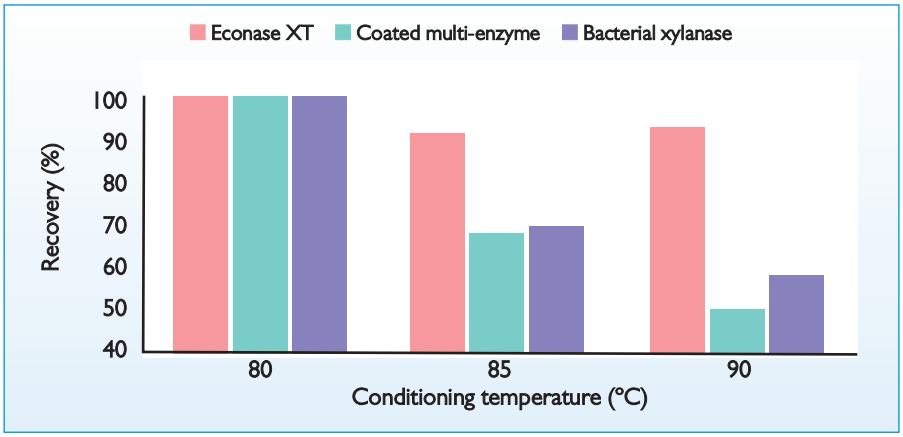

Fig. 2. The influence of feed conditioning temperature (for 20 seconds) on xylanase recovery (relative to 80˚C), demonstrating the loss of activity at higher temperatures of less thermostable products.

Important role in nutrition

Through improved degradation of dietary fibre and consequently better nutrient digestion, NSPase enzymes play an important role in poultry nutrition as a tool to reduce feed costs. NSPases spare energy in feed formulations, allowing nutritionists to reduce the AME content of corn-based diets by up to 100 Kcal/kg, thus saving as much as US$ 7.00 per tonne of feed.

Thermostability is a key issue, especially if NSPases are to be used in dry form and added to feed prior to pelleting. Not all enzymes are affected by higher pelleting temperatures in the same way.

Different strategies are used by feed enzyme manufacturers to help ensure the survival of enzymes. One alternative is to coat NSPases to protect them against moisture and high temperatures. The downside here is that coating can slow down the release and action of the enzyme upon the substrate. Enzyme suppliers need to ensure that coating techniques are fine tuned to increase recovery without impacting the release of the enzyme.

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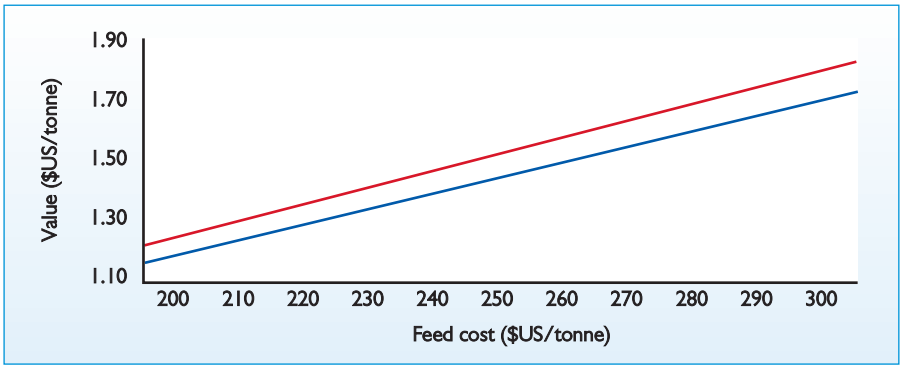
Fig. 1. The cost of 1 point in feed conversion ratio. The red line represents high performing birds and is the result of changing the FCR from 1.64-1.65; the blue line represents lower performing birds and is the result of changing from 1.74-1.75. In the range of feed costs that were assumed (US$ 200-300/tonne), it can be seen that 1 FCR point varies in cost from US$1.15-1.83/tonne.



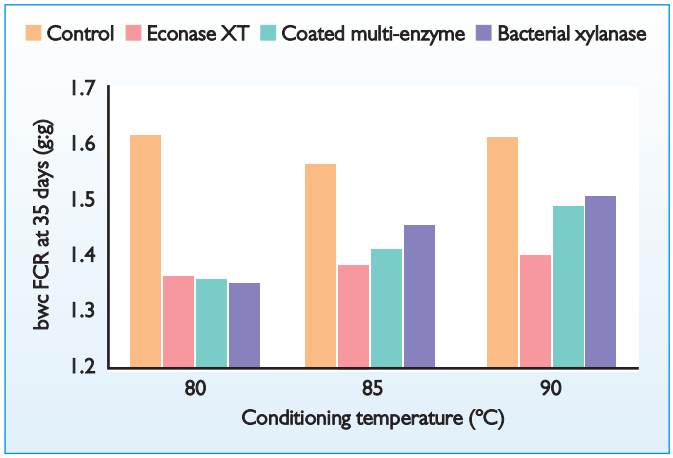


Fig. 3. The influence of pellet conditioning temperature and enzyme supplementation on 0-35 day body weight corrected feed conversion ratio (bwc FCR), showing that higher conditioning temperatures led to reduced efficacy in two of the products tested.

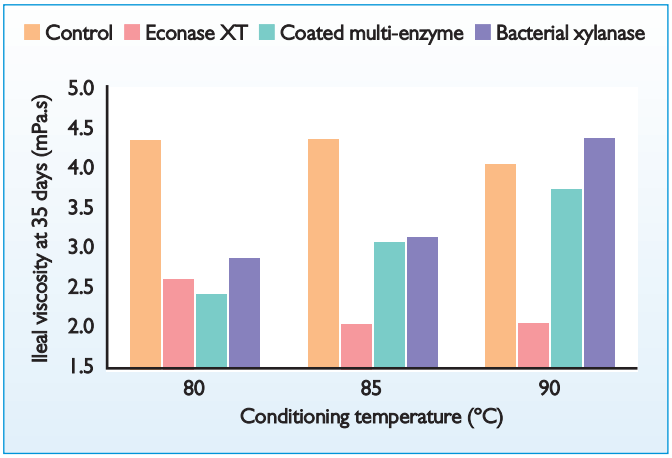


Fig. 4. The influence of pellet conditioning temperature and enzyme supplementation on day 35 ileal digesta viscosity, showing that at higher processing temperatures only Econase XT was successful in reducing viscosity.

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An alternative is to select an intrinsically thermostable enzyme that does not require any coating and survives the rigours of pelleting conditions. In this instance, it is the enzyme molecule that is intrinsically stable to pelleting temperatures, rather than stabilising techniques.

A third alternative to overcome thermal processing issues, is post-pellet liquid application, which has limited usage around the globe because of the initial investment required to install dosage systems, and the technical challenges of effective functioning in feed mills. To date, it is estimated that around 10-15% of poultry feed utilises liquid enzymes through post-pelleting application.

AB Vista recently carried out a broiler trial at a Polish university to assess the thermostability of three different commercial NSPases applied to wheat based diets processed at three different conditioning temperatures (80, 85 and 90˚C). The enzymes tested included:

- A coated multi-enzyme preparation containing primarily xylanase and glucanase activity.
- An intrinsically thermotolerant xylanase from a bacterial source.
- An intrinsically thermotolerant xylanase expressed in Trichoderma (Econase XT).

Analysis of the pelleted feed demonstrated that while Econase XT xylanase activity survived processing up to 90˚C, the other two products lost activity at higher temperatures (Fig. 2). Broiler results showed that at 80˚C all three enzymes improved performance.

Econase XT was the only enzyme that sustained a consistent effect across the different pelleting temperatures, giving the same performance at 90˚C as observed at 80˚C. This was also evident when analysing ileal viscosity of broilers at 35 days, and was closely correlated with animal performance and enzyme recovery.

The results of this trial emphasise the importance of monitoring and analysing in-feed activity of NSPases, and how selecting the right NSPase is critical to ensure maximum performance response. Linking back to the pelleting process, variation can still exist, even within a mill, between the target and actual processing temperature, resulting in some degree of loss in enzyme activity and therefore bird performance.

In recent years, producers have experienced high volatility in raw material prices and competitive meat prices, ultimately eroding profit margins.

To make the most of the animal's genetic potential, it is really important to choose the right NSPase that is able to survive the rigours of pellet processing, is flexible across different cereals, and ultimately delivers consistent bird performance. ■