A different way to successfully feed grower-finisher pigs

Grower-finisher pigs are supposed to eat, grow and stay healthy. Probiotics, or Direct Fed Microbials (DFMs) as they are also called, are not usually what comes to mind when first formulating diets for these large animals. Probiotics is a term that covers many different products available on the market today, such as yeasts, lactic acid bacteria and spore forming bacilli.

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Spore forming bacilli are easy to work with when added to feed as they can withstand the pelletising process, acids and antibiotics. Compared to diets for weaned piglets, where probiotics are used more often, this type of feed additive is not used very often in diets for these growing pigs.

It is commonly known that the feed cost is the greatest cost in swine production and many nutritional strategies can be considered when formulating feed for this segment to bring down the overall cost, while still meeting the requirements for health, nutrition and even the environment.

These strategies can include using low cost and often more fibre-rich ingredients. When choosing to use such ingredients, a challenge one must consider is to keep the feed digestible for the pig as the fibre fraction of the diet will increase.

As pigs lack the enzymes to break down non-starch polysaccharides (NSP), different approaches can be made to overcome this challenge. One approach could be adding NSP-degrading enzymes to the diet to help improve the fibre digestibility of the feed. An increased digestibility of fibre could also lead to an increase in the availability of other nutrients as some nutrients can be trapped in a fibre matrix.

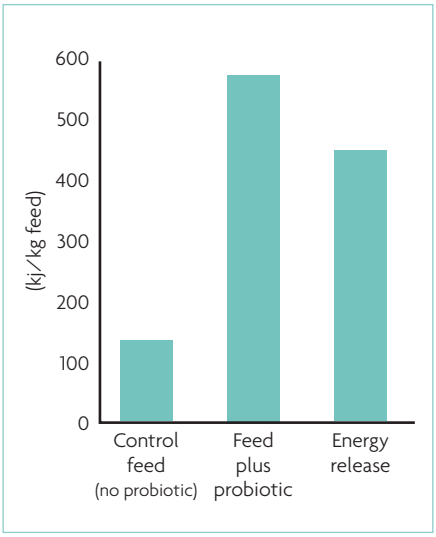


Fig. 1. Energy release made by a probiotic product consisting of Bacillus subtilis and Bacillus licheniformis strains in a diet for fatteners shown as kilo Joule (kJ) per kg of feed.

Once the digestibility is enhanced, the animal will respond with an improved performance, resulting in increased profitability.

Another approach could be to apply in-feed probiotics. Probiotics are often used to support a normal, stable intestinal tract and the term probiotics covers many different products, of which spore forming bacilli is one. A quick search in the literature shows solid evidence for this.

Bacillus based probiotics and enzyme activity

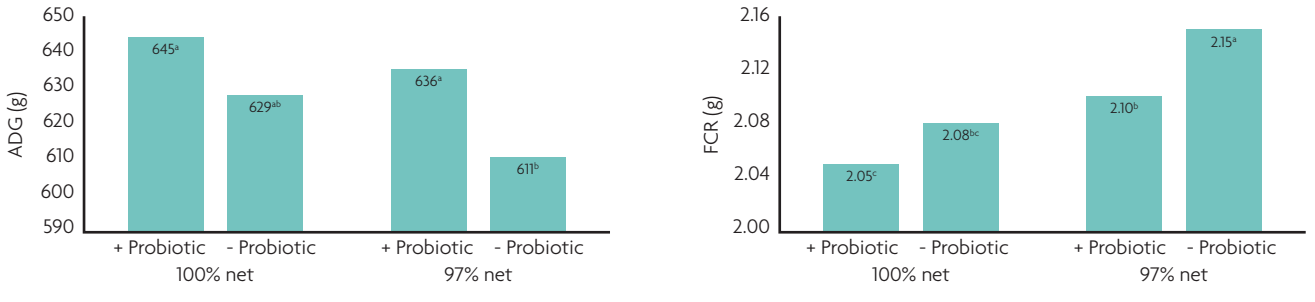
Spore forming bacilli excrete enzymes as part of their life cycle in the intestinal tract. Some bacilli do excrete enzymes in a sufficient amount into the lumen so that the host animal benefits from it as digestibility of the feed is improved.

This means that the pool of nutrients becomes larger and this results in improved performance. However, one must bear in mind that not all spore forming bacterial strains excrete the same enzymes at the same level and that strains can differ in other features too. Strains matter.

Breaking down the NSP-fraction of a diet involves a collaboration of many different enzymes that must work in a coordinated way to break down the fibres and polysaccharides. If just one of these enzymes is in short supply, that enzyme will become the limiting factor in the degradation process.

The result of the enzyme activity is a release of sugars that are easily absorbed by the pig. This sugar release can also be

Fig. 2. Average daily gain and feed conversion ratio of wean-to-finish-pigs fed either a standard diet with or without a Bacillus subtilis and Bacillus licheniformis probiotic or an energy reduced diet (-3% Net Energy). Values with different superscripts differ significantly.



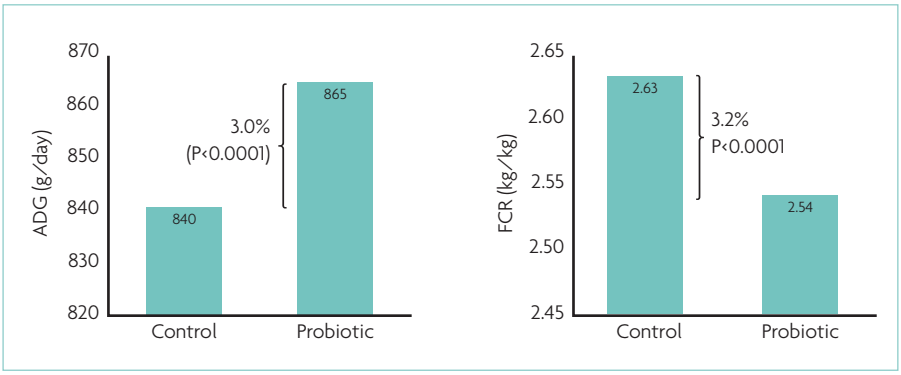


Fig. 3. A meta-analysis of average daily gain (ADG) and feed conversion ratio (FCR) of grower-finisher pigs fed standard diets supplemented with a bacillus-based probiotic consisting of the two strains Bacillus subtilis and Bacillus licheniformis.

looked at as a release of energy. Looking for specific enzymes excreted by this type of bacilli can be difficult.

Therefore, when evaluating the probiotic contribution to energy release from the fibre and polysaccharide fraction of the diet, it is important not to look only at some individual enzymes involved in the breakdown. In addition, one must look at the total formation of the end product or the absorbable sugars produced.

To measure the enzyme activity of the probiotic bacilli Chr. Hansen A/S has developed and patented a method where it is possible to show the enzyme activity of bacilli in feed. This is achieved by mixing the autoclaved feed with the probiotic product and water and leaving it for 24 hours at 37°C. The feed is autoclaved prior to the mixing with probiotics to kill other micro-organisms so only the enzyme activity of the probiotic added is measured.

The sample is then centrifuged and 3.5-dinitrosalicylic acid is added to the supernatant, of which the absorbance of light is measured. This is a way to measure the enzymatic activity as amount of reduced sugars, such as glucose, glyceraldehyde and galactose as well as disaccharides, like lactose and maltose, in the feed sample. This absorption of light is converted into Kilo calories (Kcals) or kilo Joules (kJ).

Fig. 1 shows the energy release measured by this method in a fattener diet treated with Bioplus YC, a probiotic consisting of two probiotic strains, Bacillus subtilis and Bacillus licheniformis. The diet was a typical European finisher diet and consisted of grains, DDGS and soybean meal.

The practical implications of this is that supplementation with probiotics can increase the nutrient availability which the pig will return in terms of increased performance. Another approach could be to feed a diet reduced in energy concentration. However, as one might know, what is feasible in a laboratory might be a bit more complicated at farm level.

So, to back this theory up, Chr. Hansen Swine team set up a study conducted under commercial conditions in Europe to test the effect of enzymes excreted by the probiotic consisting of Bacillus subtilis and Bacillus licheniformis. Some 576 wean-to finish pigs were split into four dietary treatments and fed in four phases: pre-starter, starter, grower and finisher.

The four treatments were:

- Standard diet, no probiotics.
- Standard diet with probiotic.
- Diet reduced in energy (3% NE), no probiotic.
- Diet reduced in energy (3% NE) with probiotic.

All pigs started at the same body weight (BW).

Results

The results showed that, as expected, the pigs fed a diet reduced in energy had a lower average daily gain (ADG) and a higher feed conversion ratio (FCR). However, supplementing the standard diet with the probiotic significantly increased the BW of the pigs by 3% and FCR by 2% (Fig. 2).

What this study also showed is that the pigs fed energy reduced diets supplemented with probiotics performed just as well as the pigs fed the standard diet.

More studies were conducted to test the effect of adding the same probiotic to standard feed of grower-finisher pigs.

Fig. 3 shows the results on ADG and FCR of a meta-analysis consisting of eight recent studies including 3,590 grower-finishers. All studies were conducted in Europe and the probiotic was added to the standard feed without reducing nutrient requirements. It was found that adding the probiotic to the feed increased ADG and improved FCR by 3%.

Based on these results, it is proven that bacillus-based probiotics can be applied to grower-finisher diets to improve profitability either through increased weight gain and a better FCR when applied to a standard diet or as a means of reducing feed cost.

As seen, this approach did not negatively affect the performance of the animals. Adding this type of probiotic to a diet for this segment gives some flexibility when formulating diets. ■