Reducing the variability of slaughter weight in fattening pigs

The sorting and grouping of pigs by body weight is a common management technique believed to minimise variation in final pig body weights and therefore able to more efficiently achieve packer weight specifications. Thus, pigs are commonly regrouped at several stages during the production cycle (at weaning, placement into the grower and finisher unit).

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Although the finishing phase is complex and efficiency subject to many production factors or variables, the movement of many animals and feed generates great concern with the cost. The consideration of the various factors and their interactions over the specific parameters, especially genetics, facility model, nutrition, health status, and the management conditions, can affect the dispersion or homogeneity of pig batches in the final days.

Increased homogeneity facilitates the posterior processing of animal products, with a consequent reduction of costs. In particular, the homogeneity of pig carcase weight significantly reduces the cost of meat processing. It is therefore usual for commercial slaughterhouses to apply a price penalty for carcases that are above or below a pre-established optimum weight.

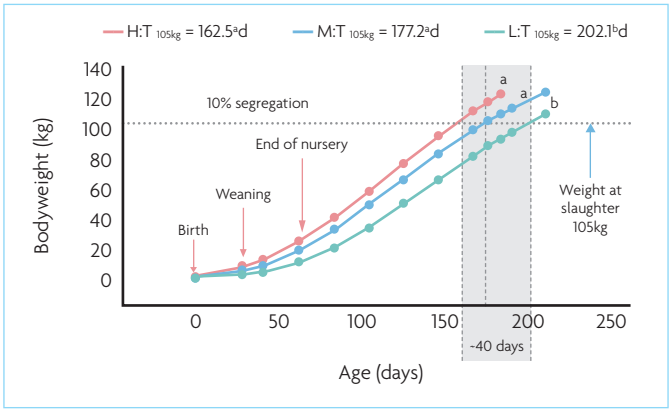

Fig. 1. Evolution of average live weight of pigs over time, depending on weight category at the end of nursery (35 days post-weaning with an average lactation of 28 days.) Statistical significance set at p <0.05. T-105kg is the number of days necessary to reach a slaughter weight of 105kg. Different [a, b, c] letters indicate significant differences. Based on López- Vergé and Solà-Oriol (2015).

Variability/homogeneity can start at birth

Variability in pig weight can start at birth and it has been widely documented that slight variations of piglet weight at birth amplify through the pig's life causing (partially) the important differences that we can then find at slaughter age (Fig. 1).

Depending on the weight category, and with the help of the growth curves, it is possible to estimate the number of days every animal needs to reach 105kg (target BW), as well as the difference in the number of days between the 'best' (red) and the 'worse' (green) group of pigs to reach the same body weight at slaughter, then differences are up to 40 days.

This 'amplification effect' has been differently quantified in literature: a difference of 0.73g between the 10% and the 90% percentile at birth may become a difference of 4.73kg at fattening, or 1.1kg of difference at weaning may become 3.8kg of difference at 138 days of age.

So variations in the weight of the animals (Fig. 1), could cause up to 40 days difference to reach target weight to slaughterhouse for animals in the same group. This causes huge losses, either for the days that more pigs have to be in the feedlot to avoid discounts in the slaughterhouse, or for penalties in the slaughterhouse produced by wanting to empty the feedlot before the next piglets can enter. There are several management strategies to try to reduce the coefficient of variation in the transition phase or bait to facilitate slaughterhouse loads and increase exploitation benefits.

Multienzyme complex can reduce pig weight variability

In a sector aiming at standardising the final product at the maximum, variability in pig weight at slaughter age is still one of the major issues in the swine industry.

The use of enzymes, especially carbohydrase in feed for swine, is a common strategy to reduce the negative effects caused by non-starch polysaccharides (NSP).

This kind of polysaccharides reduces digestion of proteins, fat, and some minerals, especially in weaned piglets where their gut and endogenous enzymes are still immature.

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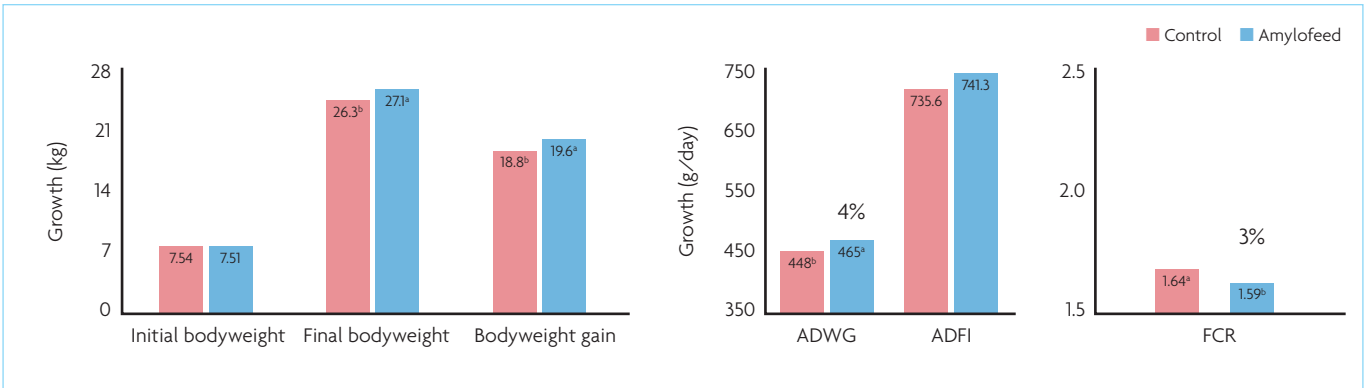
Fig. 2. Improving the growth of weaned piglets with Amylofeed (APSA R+D, Meta analysis study).



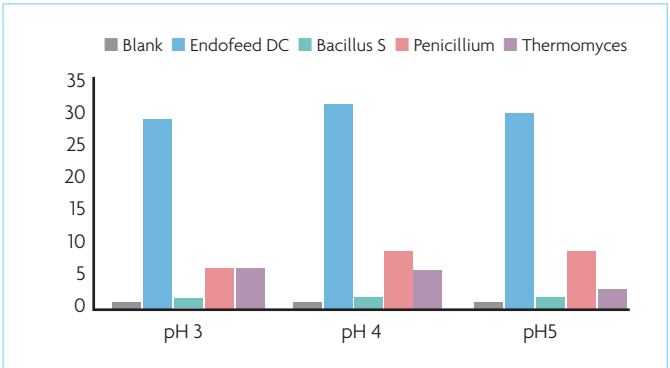


Fig. 3. Glucose release from soya bean meal samples, incubated with Endofeed DC and other enzyme products.

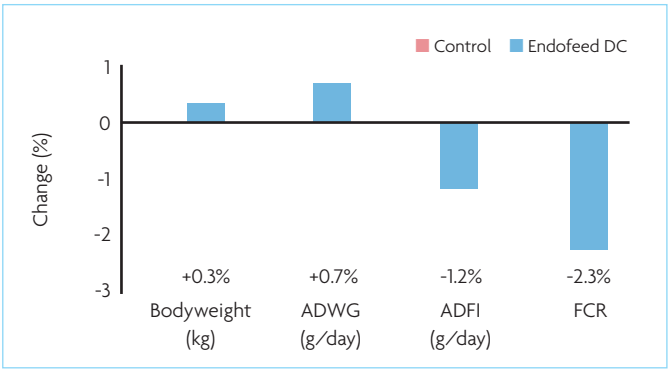


Fig. 4. Benefits in percentage of fattening pigs' performance fed 125g/ton of Endofeed DC.

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A multienzyme complex developed by Andres Pintaluba SA is produced by fermentation of a non-GMO Aspergillus niger and a non-GMO Aspergillus oryzae.

Amylofeed contains high amounts of NSP enzymes (beta-glucanases and xylanases) and high amounts of amylases designed to cover the natural post-weaning lack in endogenous amylase production and provides NSP enzymes to break down fibre of cereals and grains rich in non-starch polysaccharides.

Andres Pintaluba's database confirms that the multienzyme complex (Amylofeed) added in weaned piglet diets during 42 days improves body weight (+3%), ADWG (+4%) and FCR (-3%).

The use of Amylofeed provides excellent results, not only with wheat-barley diets but with corn-soya rations too.

With these results, it is demonstrated that an optimal feeding in the transition phase improves the speed of growth of the complete batch in the feedlot by means of a better digestive preparation during the transition phase with benefits in the next fattening phase.

Endofeed DC, a positive impact kept until slaughter

It is assumed that an adult pig can achieve a more complete digestion of nutrients thanks to the support of its matured endogenous enzymatic activity and its fermentation ability of NSP fibre in the large intestine, However, the literature shows that pigs are able to utilise moderate, but not high levels of fibre in the finisher phase.

There is a loss of energy due to methane, hydrogen, and fermentation heat decreases the amount of energy available to the pig from fermentation of fibre in the hindgut, thereby decreasing the efficiency of energy utilization. In addition, NSP interferes in the action of the endogenous enzymes of the animal (cage effect) limiting the use of AA, proteins, minerals, lipids, etc by the animal and reducing their digestibility.

Pintaluba's R&D team have been working on an enzyme complex that is able to adapt to the needs of pigs in the fattening period in order to take full advantage of the inaccessible nutrients (cage effect) inside the fibre, and at the same time does not negatively affect the feeding costs.

Endofeed DC is multi-enzyme complex, with a wide range of synergistic activities, obtained through a non-GMO fungal fermentation, specific for Aspergillus niger. It was the first enzyme registered in the EU (E1601) as a feed additive for chickens for fattening and laying hens, and recently it obtained EU authorisation for fattening pigs and minor poultry and porcine species (E-4a1601).

The use of Endofeed DC provides excellent results not only with wheat-barley diets, but with corn-soya rations too. The changes in the formulation due to the current situation in the cereals market has extended the use of Endofeed DC in others kind of rations with high inclusions of wheat, ray, triticale and sorghum.

In a battery of in vitro trials comparing with other commercial products, Endofeed DC has demonstrated a higher capacity to degrade, almost totally, the raffinose series oligosaccharides (RSO, raffinose, verbascose, stachyose), reducing the antinutritional effect and liberating more glucose units.

	Percentage							Difference percentile
Phase	5	10	25	50	75	90	95	
Birth	0.83	1.01	1.22	1.38	1.51	1.74	1.91	0.73
Weaning	4.13	5.06	5.31	5.81	6.11	6.76	6.86	1.7
Fattening	18.82	21.19	21.91	23.03	24.64	25.93	26.46	4.73

Table 1. The amplification effect (based on Vela, 2015).

The use of multi-enzyme complex targets different antinutritive compounds in feedstuffs to obtain the maximum benefit from the multi-enzyme complex, which may produce benefits than each of the enzymes acting individually.

Various practical feeding trials carried out within Europe have demonstrated the economic advantages of using Endofeed DC in fattening pigs diets. A meta-analysis study was applied in order to support the supplementary application of Endofeed DC to pigs for fattening.

Four EU efficacy trials have been carried out with similar protocol designs, according to current required quality standards. In each study, male and female pens of pigs (mixed sex pens in Study 4) were fed a growing finishing feed during 75-100 days from approximately 75 days of age until slaughter at approximately 165 days of age.

Three studies used pelleted feeds, whereas the other study used mash feed, each formulation reflecting a typical feed formula for that area and time of year. Data were tested for homogeneity and pooled to enable a statistical meta-analysis, where $P<0.05$ was considered significant, and $0.05<P\leq0.10$ was considered a near significant trend.

Fig. 4 clearly shows that FCR was significantly improved with Endofeed DC (2-3%, $P = 0.018$) with numerical benefits in slaughter weight and ADWG compared with the control.

The addition of exogenous enzymes to fattening pigs feeds in efforts to improve nutrient digestion is not a new concept. NSP-enzymes are absolutely necessary to digest NSPs in the correct place (break down the NSPs in the stomach and continue the process in the small intestine). This reaction does not lead to complete digestion (due to sugars). Exogenous enzymes cut the 'beta' bonds and therefore allow the access of endogenous enzymes to the nutrients that were previously blocked by fibre.

However, Endofeed DC can contribute to increase pig homogeneity, so more homogeneous animals mean also homogeneity of pig carcase weight with a consequent reduction in the cost of meat processing to arrive or exceed the pre-established optimum weight requirements by commercial slaughterhouses.

We proceeded to separate the 1,394 animals by weight categories. In

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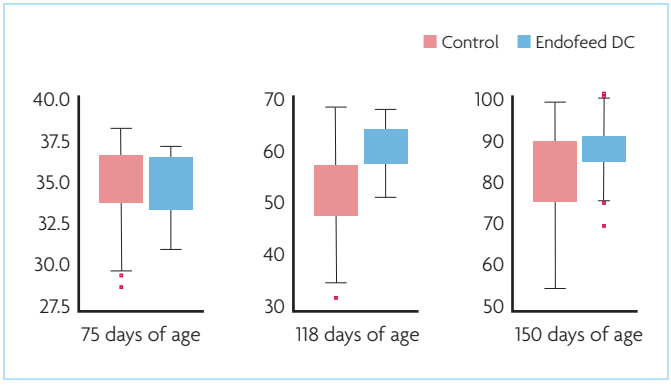
Fig. 5. Evolution of live weight over time of smaller animals (initial body weight: 29-39kg).



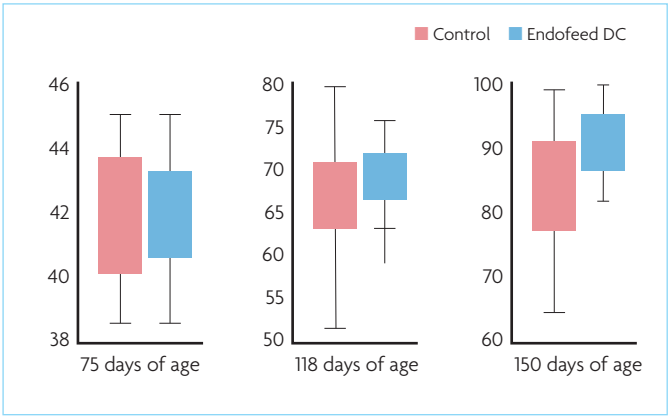


Fig. 6. Evolution of live weight over time of medium animals (initial body weight: 40-45kg).

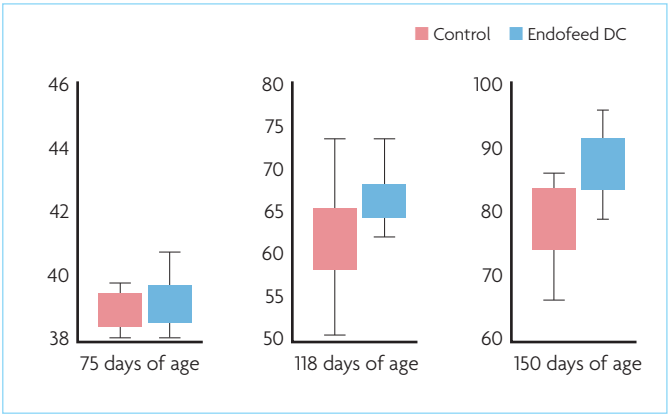


Fig. 7. Evolution of live weight over time of bigger animals (initial body weight: 46-55kg).

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practical terms, the frequency analysis of each of the weights were used to establish and assign three weight categories: small, medium and big animals, respectively.

In these four trials, in all categories, growth performances and animal homogeneity were significantly improved with the addition of Endofeed DC until slaughter.

This has been possible thanks to the nature of Endofeed DC which contains enzymatic activities to liberate more nutrients from cell wall of grains and RSO allows a positive response over animal homogeneity weight.

Conclusions

The correct management of the factors that influence the homogeneity in fattening pigs is essential to guarantee that pigs can develop their growth potential in their entirety. So, the addition of 125g/ton of Endofeed DC as a productive strategy is justified by its benefits in terms of production, especially in the improvements of pig homogeneity for commercial slaughterhouses requirements (better homogenous weights).

Endofeed DC is a versatile multi-enzyme complex that can be used in different types of formulation. It is able to improve nutrient digestibility and therefore make feed nutrients more accessible to endogenous enzymes. Endofeed DC improves animal health and productivity obtaining better profits.

Andrés Pintaluba SA and its R&D team continue to investigate the improvement of homogeneity through the development of nutritional programs of high quality and precision. Taking into account that, as the new genetics increase prolificacy, it will be necessary to reduce the dispersion that is created from birth to slaughter increasing costs in the feedlots at the time of transport to slaughterhouse.

Precision feeding is a strategy of Andres Pintaluba so that customers can optimise the application of their products to improve profits through homogeneity and nutrition. ■

References are available from the author on request