Feed Processing of Nursery Diets

Feed form, particle size, and pellet diameter are important characteristics that influence feed nutritional value, palatability, flowability, and ultimately growth performance of nursery pigs. The practical considerations of feed processing of nursery diets are discussed in this fact sheet.

Feed form

The common feed forms used in nursery diets are meal, pellets, and crumbles. Crumbles are made from whole pellets, which are broken into a smaller size in a roller mill. Typically, pellets or crumbles are preferred in initial nursery diets and either meal or pellets are often used in the following nursery diets.

Feed efficiency is typically improved with pellets compared to meal diets as a consequence of reduction in feed intake and/or less feed wastage with pellets (Groesbeck et al., 2009; Nemechek et al., 2015). However, the benefits of pelleting are greatly dependent on pellet quality (Stark et al., 1993). The greatest improvements in growth performance of nursery pigs are obtained by feeding high-quality pellets and minimizing the levels of pellet fines at the feeders to less than 20% (Nemechek et al., 2015). Meal diets in general require more feeder management to control feed wastage and improve feed efficiency compared to pellets.

Feed flowability is notably improved with pellets compared to meal diets. Feed flowability is a concern in diets with specialty proteins and lactose, as is often the case of initial nursery diets (Carney et al., 2005). Meal diets with high inclusion of specialty ingredients can increase bridging and reduce flowability in bins and feeders, which can easily limit feed availability to weanling pigs. Thus, initial nursery diets that often contain high inclusion of specialty ingredients are typically pelleted or crumbled. However, high levels of lactose in pelleted diets can increase friction during the pelleting process and potentially scorch the ingredients. The addition of 3 to 4% fat in initial nursery diets is often recommended to enhance lubrication of the pellet die and prevent heat damage.

The pelleting temperature is crucial to preserve the nutritional value of ingredients. Applying excessively high temperatures during pelleting can potentially scorch the ingredients or initiate Maillard reactions, thereby affecting feeding value and growth performance of nursery pigs (Steidinger et al., 2000). The negative effects on feeding value and growth performance of nursery pigs have been observed with pellet conditioning temperatures above 170°F (Steidinger et al., 2000).

Meal diets are commonly used in the nursery following the pelleted initial nursery diets. Compared to pellets, meal diets have less expensive feed manufacturing costs.

Particle size

Particle size is important for digestibility of nutrients and energy and for growth performance of nursery pigs (Rojas and Stein, 2017). In meal diets, a reduction in grain particle size to approximately 600 microns improves digestibility of nursery diet and growth performance of nursery pigs. However, grinding grains below 500 microns affects feed flowability and palatability (De Jong et al., 2014; Gebhardt et al., 2018). The fine grinding of grains reduces feed intake with no improvement in feed efficiency, thereby affecting growth performance of nursery pigs (De Jong et al., 2014; Bertol et al., 2017; Gebhardt et al., 2018). However, in pelleted diets, fine grinding of grains to approximately 350 microns does seem to improve growth performance of nursery pigs (De Jong et al., 2014).

Pellet diameter

Pellet diameter is generally assumed to be important for feed intake of nursery pigs. However, nursery pigs seem to be very adaptable to a variety of pellet diameters (Edge et al., 2005; van den Brand et al., 2014). The common belief that small diameter pellets improve the ability of weanling pigs to apprehend and swallow feed is not sustained (Clark et al., 2016). Actually, feeding large pellets can increase feed intake of weanling pigs during the first week in the nursery compared to feeding small pellets (0.5 inch compared to 0.125 inch pellet diameter; Clark et al., 2016).

References

Bertol, T. M., D. L. Zanotto, A. Coldebella, and J. V. Ludke. J.V. 2017. Development and validation of equations to predict the metabolizable energy value of corn for pigs. Journal of Animal Science. 95:291–301. doi:10.2527/jas.2016.0832

Carney, E. E., C. N. Groesbeck, R. D. Goodband, M. D. Tokach, J. L. Nelssen, and S. S. Dritz. 2005. Lactose and specialty protein sources influence flow ability of nursery pig diets. Kansas Agricultural Experiment Station Research Reports. 0(10). doi:10.4148/2378-5977.6838

Clark, A. B., J. A. De Jong, J. M. DeRouchey, M. D. Tokach, S. S. Dritz, R. D. Goodband, and J. C. Woodworth. 2016. Effects of creep feed pellet diameter on suckling and nursery pig performance. Journal of Animal Science. 94(Suppl. 2):100–101. doi:10.2527/msasas2016-213

De Jong, J. A., J. M. DeRouchey, M. D. Tokach, R. D. Goodband, and S. S. Dritz. 2014. Effects of fine grinding corn or dried distillers grains with solubles (DDGS) and diet form on growth performance and caloric efficiency of 11–22-kg nursery pigs. Journal of Animal Sci. 92(Suppl. 2):355. doi:10.2527/jas.2015-9149

Edge, H. L., J. A. Dalby, P. Rowlinson, and M. A. Varley. 2005. The effect of pellet diameter on the performance of young pigs. Livestock Production Science. 97:203–209. doi:10.1016/j.livprodsci.2005.04.009

Gebhardt, J. T., C. B. Paulk, M. D. Tokach, J. M. DeRouchey, R. D. Goodband, J. C. Woodworth, J. A. De Jong, K. F. Coble, C. R. Stark, C. K. Jones, and S. S. Dritz. 2018. Effect of roller mill configuration on growth performance of nursery and finishing pigs and milling characteristics. Journal of Animal Science. 96:2278–2292. doi:10.1093/jas/sky147

Groesbeck, C. N., J. M. DeRouchey, M. D. Tokach, R. D. Goodband, S. S. Dritz, and J. L. Nelssen. 2009. Effects of irradiation of feed ingredients added to meal or pelleted diets on growth performance of weanling pigs. Journal of Animal Science. 87:3997–4002. doi:10.2527/jas.2008-1156

Nemechek, J. E., M. D. Tokach, S. S. Dritz, E. D. Fruge, E. L. Hansen, R. D. Goodband, J. M. DeRouchey, and J. C. Woodworth. 2015. Effects of diet form and feeder adjustment on growth performance of nursery and finishing pigs. Journal of Animal Science. 93:4172–4180. doi:10.2527/jas.2015-9028

Rojas, O. J., and H. H. Stein. 2017. Processing of ingredients and diets and effects on nutritional value for pigs. Journal of Animal Science and Biotechnology. 8:48-61. doi:10.1186/s40104-017-0177-1

Stark, C. R., K. C. Behnke, J. D. Hancock, and R. H. Hines. 1993. Pellet quality affects growth performance of nursery and finishing pigs. Kansas Agricultural Experiment Station Research Reports. 71–74.

Steidinger, M. U., R. D. Goodband, M. D. Tokach, S. S. Dritz, J. L. Nelssen, L. J. Mckinney, B. S. Borg, and J. M. Campbell. 2000. Effects of pelleting and pellet conditioning temperatures on weanling pig performance. Journal of Animal Science. 78:3014–3018. doi:10.2527/2000.78123014x

van den Brand, H., D. Wamsteeker, M. Oostindjer, L. C. M. van Enckevort, A. F. B. van der Poel, B. Kemp, and J. E. Bolhuis. 2014. Effects of pellet diameter during and after lactation on feed intake of piglets pre- and postweaning. Journal of Animal Science. 92:4145–4153. doi:10.2527/jas.2014-7408

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