

Interaction between feed formulation and feed technology in diets fed to pigs

Hans H. Stein

University of Illinois, Urbana, IL, 61801, USA

Introduction

Feed technology is used to prepare diets for poultry and pigs and with more sophisticated technologies, more opportunities for using feed technology to improve the nutritional value of diets are emerging.

Grinding, extrusion, pelleting, and enzyme application

Grinding to reduce the particle size below 800 microns does not influence digestibility of phosphorus and amino acids (AA), but the apparent ileal digestibility (AID) of starch increases linearly by up to 8% if particle size of maize is reduced from 800 to 339 microns. This results in a linear increase of up to 4% in the metabolizable energy (ME) of maize (Rojas and Stein, 2015). Extrusion of field peas and cereal grains increases AID of starch and AA by 2 to 8% and ME by up to 5% (Stein and Bohlke, 2007; Rodriguez et al., 2019). Therefore, diets that are extruded may be formulated with reduced concentrations of high-energy and high-AA ingredients.

Pelleting increases AID of starch and AA by 1 to 3% (Stein and Bohlke, 2007), and pigs fed pelleted diets instead of meal diets usually have 3 to 8% greater gain to feed ratios (Overholt et al., 2016).

Phytase increases STTD of P by up to 150% and reduces the need for addition of inorganic P in formulations (Almeida and Stein, 2010). Carbohydrases may increase ME by 1 to 4% and the response to carbohydrases is greater in wheat-based diets than in maize-based diets (Abelilla and Stein, 2019).

Conclusion

A number of feed technologies may be used to improve the nutritional values of diets and feed ingredients and all of these technologies will impact how diets are formulated.

References

- Abelilla, J.J. & Stein, H.H. (2019). Degradation of dietary fiber in the stomach, small intestine, and large intestine of growing pigs fed corn- or wheat-based diets without or with microbial xylanase. *J. Anim. Sci.* 97: 338-352.
- Almeida, F.N. & Stein, H.H. (2010). Performance and phosphorus balance of pigs fed diets formulated on the basis of values for standardized total tract digestibility of phosphorus. *J. Anim. Sci.* 88: 2968-2977.
- Overholt, M.F., Lowell, J.E., Arkfeld, E.K., Grossman, I.M., Stein, H.H., Dilger, A.C. Boler, D.D. (2016). Effects of pelleting diets without or with distiller's dried grains with solubles on growth performance, carcass characteristics, and gastrointestinal weights of growing-finishing barrows and gilts. *J. Anim. Sci.* 94: 2172-2183.
- Rodriguez, D.A., Lee, S.A., Muckey, M.B., Jones, C.K. & Stein, H.H. (2019). Digestibility of amino acids, fiber, and energy, and concentrations of digestible and metabolizable energy in conventional and extruded yellow dent corn, wheat, and sorghum fed to growing pigs. *Am. Soc. Anim. Sci. Midwest Meeting, Omaha. Abstract.*
- Rojas, O.J. & Stein, H.H. (2015). Effects of reducing the particle size of corn grain on the concentration of digestible and metabolizable energy and on the digestibility of energy and nutrients in corn grain fed to growing pigs. *Livest. Sci.* 181: 187-193.
- Stein, H.H. & Bohlke, R.A. (2007). The effects of thermal treatment of field peas (*Pisum sativum L.*) on nutrient and energy digestibility by growing pigs. *J. Anim. Sci.* 85: 1424-1431.