Particle size of grains and swine diets from on-farm mills in Western Canada and the cost of grinding wheat or barley using a hammer or a roller mill.

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Particle size reduction improves feed efficiency in all stages of the production cycle in pigs. Based on studies by researchers at Kansas State University (KSU), an average particle size of 700 to 800 microns is recommended. However, this recommendation is based on studies conducted using corn-soybean meal based diets. To our knowledge, there is no information on the effect of particle size in wheat and barley-based diets from on-farm mills in Western Canada. This presents an opportunity to improve animal performance and income for producers by improving our understanding of particle size under regional conditions.

Feed and ground grain samples from one toll mill facility and four on-farm mills (two in Alberta and two in Saskatchewan) were collected and analyzed for average particle size to establish the variability among mills. Except for one farm that uses a disk mill, all of the participants use a hammer mill. The average particle size in samples of wheat was 795 microns (697 to 889 microns) and barley was 833 microns (818 to 827 microns). On average, wheat was ground within standards set by the Kansas State University (700 to 800 microns using corn-soybean meal-based diets) while barley particle size was slightly coarser, but within acceptable variation limits (+10 per cent).

Particle size of complete feeds from two of the farms was higher than KSU recommendation indicating possible losses in terms of feed efficiency. The diet particle size ranged from 657 to 968 microns (832 microns on average). Variability in diet particle size was possibly due to the type of grain used,

CONTINUED ON PAGE 60

Danilo Sotto

other ingredients used, and their proportion in the formulation. All farms were aware of the benefits of particle size reduction in improving feed efficiency; however none had a program in place to monitor particle size. The majority of the on-farm mills cite flowability as an issue when grinding grains (or diets) to a smaller particle size. However, our results suggest that bulk density, fat content and their interaction with particle size may also affect flowability. Regardless of particle size, wheat and wheat-based diets flowed better than barley and barley-based diets.

The second project used five sources each of wheat and barley, ground to an average particle size of 550, 700 and 850 microns using either a hammer or a roller mill to determine the effect of grain, type of grinder, particle size and their interaction on grinding cost, particle and handling characteristics of the ground grains. Using current power cost, grinding barley resulted in higher grinding cost compared to wheat (0.58 vs 0.36 $/ton). Regardless of grain and particle size, grinding cost using the roller mill was lower than the hammer mill (0.27 vs 0.66 $/ton). Reducing the particle size of wheat or barley by 300 microns regardless of grinder increased grinding cost by 41 per cent in barley and 38 per cent in wheat. Flowability was negatively affected when the particle size of either wheat or barley was reduced. Consistent with results from the first project, wheat flowed better than barley, regardless of particle size. We suspect that an optimum ratio of wheat and barley in a finely ground diet may address flowability issues.

Grinding barley from 850 to 550 microns using the hammer mill had the highest grinding cost (from $0.64/tonne to $1.05/tonne). Using this information and the feed efficiency improvement of 1.3 per cent for every 100 micron reduction in particle size, we estimate a net savings of $7.8/pig due to reduction in total feed cost just by reducing particle size of barley by 300 microns.

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Biography

Danilo Sotto, Jr. is a PhD student at the Prairie Swine Centre Inc. and University of Saskatchewan under the supervision of Dr. Denise Beaulieu. He obtained his B.Sc. and M.Sc. from the University of the Philippines Los Banos and has been working with the Philipine feed industry before coming to Saskatchewan in 2014. As an animal nutritionist, he is interested in finding ways to improve feeding value of ingredients through feed processing in order to improve animal performance and health, and reduce feed cost to improve profitability of pig production. His Ph. D. program is also supported by a study grant provided by industry partner Gowans Feed Consulting. ■