The impact of grain particle size on swine feeding

By Kieran Brett

University of Saskatchewan researchers studied how producers can balance particle size, ease of handling and operating cost. Funding from ACIDF and ALMA helped make this work possible.

The way that feed grains are processed has a direct impact on the performance of a swine herd. In general, digestibility of starch and other nutrients improves as particle size is reduced. This is because a smaller particle size increases surface area so it interacts better with the pig's digestive enzymes.

Still, it's possible to *over*-process grain for swine feed. An excessively fine particle can reduce flowability and make handling more time-consuming. At a certain point, more finely processed grains can also predispose pigs to gastric ulcers.

As Denise Beaulieu (pictured left) explains, industry practice reflects Kansas State University swine feeding research. This research determined that the ideal average particle size for swine rations based on corn and soybean meal is 700 to 800 microns. Particle size is the average diameter of individual particles of feed. There are 10,000 micrometres (microns) in one centimetre.

"Our concern is that with Kansas State, most of that research has been done with corn, which is different from the grains we commonly use in Western Canada," says Beaulieu, Monogastric Nutritionist with the University of Saskatchewan. "We hypothesize that, because of differences in fiber type and amount, the optimal particle size will vary among different grains."

How are producers doing on particle size?

In 2014, University of Saskatchewan Professor Tom Scott began to study the impacts of processing and average particle sizes in wheat and barley, grains typically used in prairie swine rations.

When Scott retired in 2015, Beaulieu stepped in to lead the project. University of Saskatchewan graduate student Danilo Sotto joined the team soon after. This two-year study was supported by the Alberta Crop Industry Development Fund (ACIDF) through the $8 million Feeding Initiative funded by the Alberta Livestock and Meat Agency (ALMA).

In the first part of this research, Sotto surveyed grinding practices at one toll feed mill and four on-farm mills in swine operations in Alberta and Saskatchewan. The intention was to assess current practices around grinding and particle size.

"Most of the mills are using hammer mills and we expect this is because of cheaper equipment cost and ease of use," says Sotto. "In terms of particle size, with all the samples that we gathered, two of

the on-farm mills were grinding higher than the recommended particle size, at about 900 microns. The rest were grinding within accepted standards."

Grinding costs for wheat and barley

While grinding grain as close as possible to the target micron size can result in performance benefits, these gains come at a cost. In part two of this study, Beaulieu and Sotto examined the cost of grinding wheat and barley to a number of different particle sizes using either a hammer or a roller mill.

They found that grinding barley cost an average of $0.58 per tonne compared to wheat at $0.36 per tonne. While both grains were found to flow less successfully as particle size was reduced, overall, wheat flowed better than barley. Regardless of the grain used, a roller mill had a lower grinding cost than a hammer mill.

For swine producers concerned about feed efficiency, operating efficiency *and* cost efficiency, this study's findings will make it easier to make decisions that work for their business.

Says Beaulieu: "What producers observe, maybe even more than pig performance, is how the grain flows through their system. If they have to go out every day and bang bins to get the grain to flow down, they will change particle size pretty quick. Overall, we're balancing the cost of reducing particle size with the improvement in how that feed is being used by the animal."

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