SWINE UPDATE

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Factors affecting flow characteristics of ground corn

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Decreasing particle size and adding fat to diets can improve pig performance and profitability. Limits to reducing grain particle size and amount of added fat are frequently based on the ability of the feed to flow through feed delivery systems and feeders. Additionally, grain ground with a roller mill typically has a more uniform particle size than that ground with a hammer mill. Thus, type of grinding is expected to affect feed flow ability. We conducted three experiments on the flow characteristics of ground corn.

The objective in the first experiment was to evaluate the effect of mill type, particle size and added fat on the flow ability of ground corn. Six different particle size samples were evaluated for each mill type. The particle size mean and standard deviation for the corn ground with a roller mill were 1,235 (1.98), 887 (1.83), 848 (1.84), 747 (2.03), and 502 (1.97), and for the hammer-milled corn, 980 (2.52), 931 (2.49), 665 (2.49), 477 (2.25), and 390 (2.12) microns. All samples were dried 12 hours to equalize moisture content. Soy oil was then added at 0, 2, 4, 6, and 8 percent to portions of each sample.

Flow ability was determined by measuring the angle of repose, which is the maximum angle measured in degrees at which a pile of grain retains its slope. A large angle of repose represents a steeper slope and poorer flow ability.

There was a three-way interaction ($P<0.05$) between size, fat and mill type (Figure 1). Corn ground with a hammer mill without added fat had a similar angle of repose to the corn ground with a roller mill with 6 percent added fat. Angle of repose increased as particle size was reduced and more fat was added. The rate of increase was lower as particle size was reduced, but at reduced particle sizes, the rate of increase was greater for hammer-milled corn compared to roller-milled corn. This indicates corn ground with a roller mill that has 6 percent added fat should have flow ability similar to hammer-milled corn without added fat.

The objective of the second and third experiments was to determine if the flow differences between hammer mill and roller mill ground corn were due to the particle size uniformity as measured by particle size standard deviation. In both studies, roller mill and hammer mill corn samples were sifted through 13 screens and material from each screen was collected. This gave us samples of 13 different particle sizes with extremely narrow particle size deviation. Samples were dried 12 hours to

continued on page 2

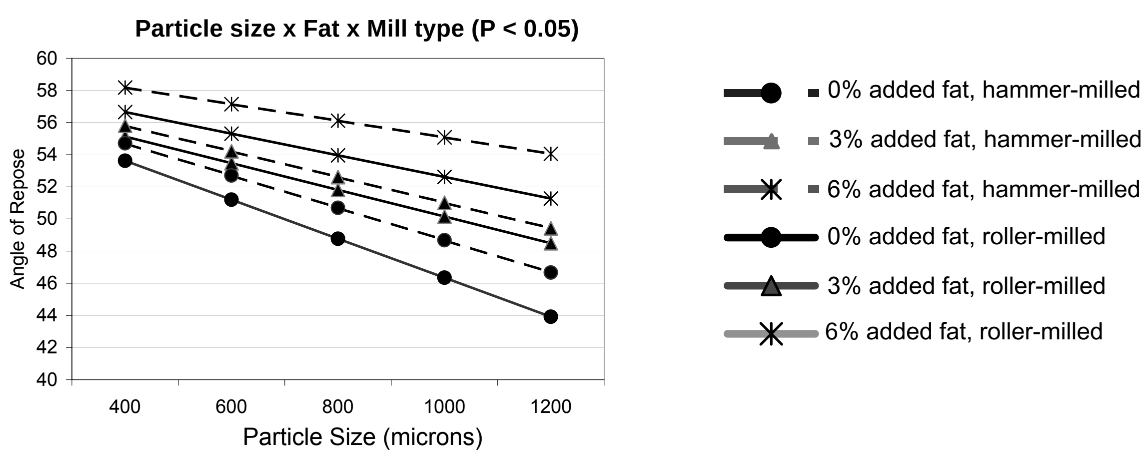

Figure 1. Effect of mill type, particle size and added fat on flow ability of ground corn.

from page 1

equalize moisture content. Soy oil was then added at 0, 4, and 8 percent to samples. Flow ability was then determined by measuring angle of repose. In the second experiment, we created five roller-mill samples with mean particle size ranging from 1,415 to 343 microns and five hammer-mill samples from 1,382 to 333 microns. All samples were created to have similar PSSD, ranging from 1.1 to 1.3. There was an interaction (P<0.05) between particle size, added fat, and mill type (Figure 2). Increasing fat content increased the angle of repose; however, the difference was less in fine-ground hammer-mill samples than in roller-mill samples. In roller-mill samples, decreasing particle size had less of an effect on flow ability than in hammer-mill ground corn.

In the third experiment, we used four roller-mill and four hammer-mill samples from the previously collected grain. All samples were similar in mean particle size, but with varying standard deviation. The roller-mill sample particle size and particle size standard deviations were 679 (1.62), 674 (1.89), 667 (2.10), and 673 (2.22) microns, and for hammer-milled corn, 662 (1.62), 641 (1.88), 653 (2.12), and 670 (2.27) microns. There was no (P>0.10) fat-PPSD-mill type interaction observed. Increasing fat (P<0.04) and particle size standard deviation (P<0.001) decreased flow ability (Figure 3).

This data suggest the greater flow ability of roller-mill ground corn appears to be a result of less particle size variation. However, with fine particle sizes (<700 microns) other factors, such as particle shape, may also contribute to flow ability. Because of the economic forces behind fine grinding and adding fat, feed ground with a roller mill will have better flow ability than feed ground with a hammer mill.

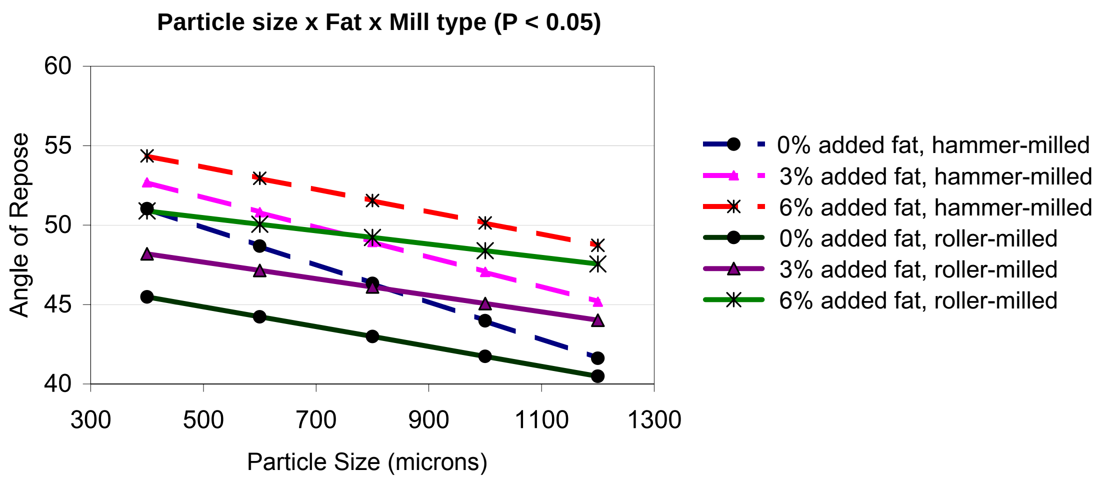

Figure 2. Effect of particle size with narrow standard deviation of 1.1 to 1.3, on ground grain flow ability.

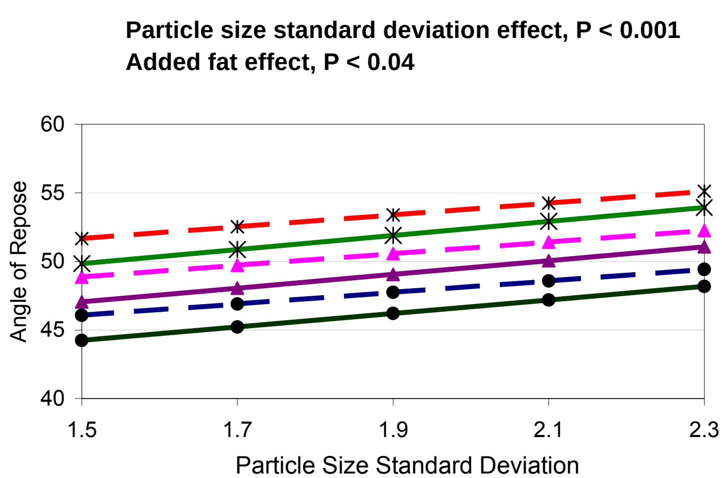

Figure 3. Effect of particle size standard deviation on ground grain flow ability.

Use heart girth to estimate the weight of finishing pigs

Crystal N. Groesbeck

Many 4-H participants and swine producers may not have access to an accurate scalefor weighing their pigs. Heart girth measurement can be a tool for 4-H members and producers to estimate body weight and track the growth of pigs. Using heart girth to estimate weight may also help if only a few pigs need to be weighed because it reduces scale setup and teardown time and transportation of the pigs.

Kansas State University swine researchers recently completed a study to develop a regression equation to determine pig weight based on heart girth, and to validate its accuracy. Heart girth and body weight were measured for 100 growing-finishing pigs (50 to 273 lb.) at the K-State Swine Teaching and Research Center. Heart girth was measured in inches using a cloth measuring tape. The tape was placed directly behind the front legs, wrapped snugly around the heart girth and read directly behind the shoulders.

Heart girth was strongly correlated (r^2= .98) with body weight, with the regression equation: pig weight = 10.1709 x Heart girth (inches) – 205.7492. The 95 percent confidence interval shows the projected weight to be ± 10 pounds of the actual weight of the pig. The table below contains the estimated pig weight based on its heart girth measurement.

There are a few problems that may occur when measuring heart girth on pigs. Pigs often squirm or raise and lower their heads, which can cause variations in the measurement. A confined pig is easiest to measure with the cloth tape. We suggest taking three separate heart girth measurements and using the average. Misreading the heart girth measurement by 1 inch will result in a 10-pound error in weight. Averaging three measurements should more accurately represent true girth measurement. The pigs should be on continuous feed and water to insure accurate results. We have found heart girth measurements to be inaccurate if pigs have recently been transported or held off feed or water for a short period of time.

Heart girth measuring can be useful for 4-H members and swine producers for estimating pig weight.

Table 1. Heart girth vs. pig weight

Heart Girth, inches	Pig Weight, lb.
25	49
26	59
27	69
28	79
29	89
30	99
31	110
32	120
33	130
34	140
35	150
36	160
37	171
38	181
39	191
40	201
41	211
42	221
43	232
44	242
45	252
46	262
47	272
48	282

Upcoming Events

Kansas Swine Classic
July 11-12
Manhattan, KS

World Pork Expo
June 5-7
Des Moines, IA

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