Survey of the Coarseness of Grind of Swine Feed in Iowa

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Summary

The conclusions that we make are that the current methods of processing feed are effective. Swine diets can effectively be processed using either a hammer or roller mill. Additionally, diets can be manufactured effectively at home or in a commercial setting. Of the 52 samples of complete feed there were 30 samples that were above 750 microns and with a mean of 901 microns (200 microns above optimal). For every 100 microns away from the optimal range gives up 65 cents a pig, assuming that our sample is representative of all the feed fed in the state of Iowa producers are giving up over 14 million dollars that could be gained by grinding their feed to the optimum range. Many producers are doing a good job making their feed but there is a significant amount of money that could be saved from improved feed manufacturing methods. This includes making sure that the hammers are turned before the corners get dull or that the roller is replaced before the corrugations get to large.

Introduction

In livestock industries, feed efficiency is a key factor of profitability. Many factors determine feed efficiency; one being how coarsely feed is ground. When feed is not properly ground multitudes of problems occur. The particle size of the feed has a very large influence on how efficient the hogs will be. Kansas State has done studies that show the optimal particle size is between 650 and 750 microns. Economically, this means that every 100 microns over this suggested window will result in and increased cost of 65 cents per pig.

From my experience collecting the samples of feed we used for our study it is very apparent that producers do understand that the feed needs to be ground very fine. Most of the producers I talked to said "the finer the better". According to the principals of mechanical and enzymatic digestion this makes sense because of increased surface area. Alternatively, when the grind of the feed becomes too fine the stomach becomes too fluid and which makes the pigs much more susceptible to gastric lesions.

The goal of our survey was to take a series of samples from around the state that represents all the regions of the state. With this sample we gave the individual producers feedback, to identify production problems and improve in feed production. We also analyzed the correlations between the various stages of feed, type of cereal grain, type of milling system to see which of these systems are doing the best job.

Procedure

With the help of the ISU field staff and Iowa Pork Producers we collected samples of swine feed throughout Iowa. A total of 63 feed samples were obtained including 52 complete feed samples, 7 ground corn samples, and 4 distillers dried grains with solubles (DDGS). For the purposes of this report, the DDGS samples were omitted. Using a three sieve system we measured the particle size of the samples. The sieve system consists of 1700 micron sieve was on top, followed by the 600 micron sieve that had one ball and one caruncle within it, 300 micron sieve with two caruncles and one ball on the receiving pan. To measure the feed sample we placed 50 grams of feed in the top or 1700 micron sieve and shook the sieves vigorously from side to side for ninety seconds. To calculate the particle size we entered the weights of the sieves before and after the sample was shaken through the sieves into the particle size spread sheet. The spreadsheet used a regression equation to calculate the particle size of each sample. With the results we compiled statistical data and gave the producers feedback.

Results

We collected 63 samples from around the state and the mean particle size was 786 microns (SD ± 178 microns). The feed samples were slightly above the optimum range of particle size (650-750 microns). Of the feed that we collected 52 of these samples were complete feed and the average particle size was 803 microns (SD ± 154 microns). This is also above the optimum range of particle size. Seven samples were pure corn that was used as an element to a complete feed and the average particle sizes of the corn samples were 731 microns (SD ± 207 microns). Additionally we recorded and compared the differences in the milling processes. We did not see a statistically significant difference ($P>0.05$) between feed milled at home or commercially and feed processed with a hammer mill or a roller mill.

Feed Type Sample Type *Grinding Type*	**Particle Size (± SD), Microns** **Feed** Sample *Grinding*	**Number of Samples** **Feed** Sample *Grinding*
Complete Feed	**803 ± 154**	**52**
Home Milling System[1]	800 ± 154	21
Commercial Milling System[1]	806 ± 149	31
Roller Mill	*815 ± 161*	*41*
Hammer Mill	*759 ± 118*	*11*
Corn	**731 ± 207**	**7**
Home Milling System [1]	628 ± 140	3
Commercial Milling System[1]	809 ± 232	4
Roller Mill	*758 ± 213*	*6*
Hammer Mill	*575*	*1*

[1]No statistical difference was observed for particle size between home milling and commercially milled feed when either complete feed or ground corn was evaluated. Additionally, there was no particle size difference between complete feed samples that were processed with a roller mill or hammer mill. The same comparison could not be made when evaluating corn samples because an insufficient number of samples processed with a hammer mill.