

spectively). The final prediction model on the NIRS shows the accumulation of sample which will remain in each sieve and the calibration comparison compared to the SV methodology (Table 165) with all sieves showing a strong correlation and RPD. Overall, the results confirm that a HHNIR can be used on site to instantly determine corn particle size, corn moisture and corn particle distribution.

Key Words: Particle Size, Corn, Near Infrared Spectroscopy

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166 (Young Scholars) Effects of feed truck unloading and swine barn feed line location on pellet quality and nutrient segregation.

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Two experiments were conducted at a commercial feed mill and 6 commercial wean to finish pig sites to determine the effects of feed truck unloading auger RPM on pellet quality and unloading time, and the effects of feed line location on pellet quality and nutrient concentration of intact pellets and their fines. In Exp. 1, pelleted feed was unloaded using 3 speeds (900, 1150, and 1400 RPM) from each of 8 compartments of a feed truck (Walinga Inc., Guelph, ON, Canada). Six samples per compartment were collected creating 16 replications/unloading speed. There was an unloading speed \times trailer compartment interaction ($P = 0.031$; SEM = 17.4). The difference in unloading time from the front to rear compartment was greatest at the slowest unloading speed and similar at the 2 highest unloading speeds (70 vs. 35 and 37 s). The percentage of fines formed during unloading was not influenced by unloading speed, but tended to increase (quadratic; $P = 0.081$; SEM = 2.27) from the front (8.2%) to the rear compartment (10.7%). In Exp. 2, pelleted feed samples were collected during unloading into a commercial feed bin at 6 finishing pig sites with 2 feed lines, resulting in 12 replications per feed line location. Samples were collected from the feed line at 6, 35, and 76 m from the feed bin. There were no interactions between feed line location and nutrient profile of the fines and pellets. There was no effect of feed line location on pellet durability index, percentage fines, percentage fines formed, or the nutrient profile of pellets or fines. Across locations, fines had decreased ($P < 0.05$) CP (12.4 vs. 15.3%; SEM = 0.14) and P (0.37 vs. 0.40%; SEM = 0.006), but greater ($P < 0.05$) ADF (3.7 vs. 3.2%; SEM = 0.24), crude fiber (2.7 vs. 2.2%; SEM = 0.09), Ca (0.47 vs. 0.44%; SEM = 0.012), ether extract (6.2 vs. 5.2%; SEM = 0.11), and starch (47.4 vs. 44.7%; SEM = 0.42) for the fines and pellets, respectively. In conclusion, the front compartments closer to the truck cab resulted in fewer fines formed from loading to unloading. Decreasing unloading speed significantly

increased the amount of time taken to unload a feed truck but did not alter fines formed. Feeder distance from the bin did not influence fines formation. There were significant differences in nutrient profile between fines and pellets. Understanding the location of fines creation during the feed delivery process may allow for alternative methods to reduce the formation of fines and subsequent nutrient segregation.

Key Words: feed mill, fines, pellets

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167 Effect of ground corn fractionation on flowability.

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Particle size reduction is an important component of feed manufacturing that impacts pellet quality and animal feed efficiency. However, reducing particle size too fine often results in reduced flowability of the ground corn and finished feed, which creates potential handling and storage concerns at the feed mill and farm. The objective of this experiment was to determine how fractionation affected flowability of ground corn. Whole corn was received from a single source and ground to achieve 3 target particle sizes, 400, 500, and 600 μm , with actual results of 469, 560, and 614 μm . Each target particle size was fractionated into 3 fractions: coarse ($> 630 \mu\text{m}$), medium ($< 630 \mu\text{m}$ and $> 282 \mu\text{m}$), and fine ($< 282 \mu\text{m}$) particles using a vibratory separator (model LS18SP3, SWECO, Florence, KY). Within each particle size, the percentage of ground corn as each fraction included: 400 μm : 57.5, 32.3, and 4.6% for coarse, medium, and fine, respectively; 500 μm : 64.4, 30.1, and 1.80% for coarse, medium, and fine, respectively; and 600 μm : 71.2, 23.2, and 0.90% for coarse, medium, and fine, respectively. When the target particle sizes were fractionated, their particle sizes were: 400 μm : 744, 269, and 94 μm for coarse, medium, and fine, respectively; 500 μm : 815, 253, and 96 μm for coarse, medium, and fine, respectively; and 600 μm : 898, 220, and 99 μm for coarse, medium, and fine, respectively. Fractionated samples were analyzed for multiple flowability characteristics, including: angle of repose, critical orifice diameter, composite flow index (CFI), density, and compressibility. Treatments were arranged in a nested model with 3 replicates per treatment. Data were analyzed using the GLIMMIX procedure of SAS. When particle size was analyzed as a main effect, density affected flowability ($P = 0.014$) with the 400 μm having the lowest density. However, when fractionation was nested within particle size, it impacted ($P < 0.001$) all measures of flowability, with the fine fraction ($< 282 \mu\text{m}$) of the 400 μm corn having the poorest flowability. In conclusion, reducing particle size resulted in the ground corn having poorer flowability characteristics, caused predominantly by particles that passed through 282 μm . Based on this data, producers may potentially grind corn to a lower particle size while maintaining flowability if fine particles ($< 282 \mu\text{m}$) are removed.

Key Words: corn, flowability, particle size analysis

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