RESEARCH ABSTRACT

ANIMAL SCIENCE

Title: Defining the energy content (DE, ME, and NE) of drought-stressed corn and identifying risk factors that lower energy – **NPB #12-193**

Investigators: John Patience, Ph.D.

Institution: Iowa State University

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Scientific abstract:

Record-breaking heat and lack of rainfall during the 2012 growing season resulted in drought-stressed growing conditions. An experiment was conducted to investigate the impact of these conditions on nutrient composition and energy (DE, ME, and NE) in corn, and determine if relationships exist between corn quality measurements, nutrient content, and digestibility of energy. Twenty-eight samples of corn from the 2012 crop, plus 2 samples of corn from the 2011 crop to serve as a positive control, were collected across the Midwest using yield as an initial screen for drought impact. Yields ranged from <50 to >200 bu./acre. Each sample was graded by an official U.S. grain inspection agency and analyzed for 1,000 kernel weight, NIR values, EE, NDF, and CP content. Diets were formulated using each of the 30 corn samples plus vitamins, minerals, and 0.4% titanium dioxide as an indigestible marker. Diets were fed at a level of approximately 2.6 times the estimated energy required for maintenance (NRC 2012) based upon the average initial BW of the pigs at the beginning of 4 collection periods. Each of the 4 collection periods consisted of 6 days adjustment to the test diet followed by 3 days of fecal sample collection followed by 5 days of feeding a fully balanced grower diet; the latter was fed to ensure that the low amino acid test diets did not impair digestion functions in subsequent collection periods. Sixty individually-housed barrows (PIC 359 X C29; initial BW=34.2±0.18 kg) were randomly allotted in an incomplete crossover design with 30 diets and 4 periods. Diet and fecal samples were analyzed for DM, titanium dioxide, and GE in order to determine DE values. ME and NE values were then calculated from DE values using methods developed by Noblet and Shi (1993) and Noblet *et al.* (1994) respectively. Mean DE, ME, and NE values between the 2011 and 2012 corn samples were not different (3.72 vs. 3.68 Mcal/kg respectively, $P>0.10$; 3.50 vs. 3.47 Mcal/kg respectively, $P>0.10$; and 2.61 vs 2.57 Mcal/kg respectively, $P>0.10$). Comparing 2011 with 2012, there were no statistically significant differences in EE (4.07% vs 3.96%; $P>0.10$), CP (8.56 vs 9.18%; $P>0.10$), or starch (70.5 vs 69.5%; $P>0.10$). However, NDF was higher in the 2012 corn samples (8.19%) when compared to 2011 (6.92%); $P=0.0154$. The percentage of total damaged kernels tended to be higher in the 2012 corn (1.65%) as compared to 2011 (0.90%); $P=0.684$. There were no differences in any of the other physical characteristics measured. There were very weak correlations between both NDF and DE ($R^2= -0.26$; $P=0.008$) and between density and DE ($R^2=0.26$; $P=0.007$). No other relationships were found between any single corn quality measurement, physical or chemical, and DE ($P>0.10$). In conclusion, energy of corn grown under drought-stressed conditions was not different from corn grown in the previous year under "normal" conditions.