RESEARCH ABSTRACT
ANIMAL SCIENCE

Title: Impact of dietary fiber on nutrient utilization by the pig and on the efficacy of the phytase enzyme **NPB #16-016**

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Date submitted: October 1, 2018

Scientific Abstract

A set of experiments were designed to test two hypotheses; first, that adding insoluble dietary fiber (IDF) would decrease the digestibility of various fiber components in the gastrointestinal tract, where the response to IDF was assessed to determine differences under constant nutrient or floating nutrient conditions; and second, that fiber would affect the efficacy of the phytase enzyme. In experiment 1, a total of 21 ileal-cannulated gilts (33 ± 0.4 kg BW) were randomly allocated to 1 of 7 treatments over 3 sample collection periods. Treatments consisted of a 0% corn DDGS basal diet, plus diets containing 15, 30, or 45% of DDGS as a source of IDF. Diets were formulated using 1 of 2 different approaches: constant nutrient (CN) where nutrients were held equal to the basal diet, or where DDGS were added at the expense of corn and all other ingredients remained constant, so nutrient levels were allowed to "float" (CI). Chromic oxide was added to the diets at 0.5% as an indigestible marker. The MIXED procedure of SAS was used to test linear estimates with pig and collection as random effects. In experiment 1, all of the apparent ileal digestibility (AID) and the apparent total tract digestibility (ATTD) variables tested were affected linearly with the addition of IDF ($P < 0.05$), except the ATTD of acid detergent fiber (ADF) which was not affected ($P = 0.753$). The addition of IDF decreased the AID of DM, GE, starch, IDF, soluble dietary fiber (SDF), total dietary fiber (TDF) and neutral detergent fiber (NDF), but increased AID of acid detergent fiber (ADF). The AID of acid hydrolyzed ether extract (AEE) decreased with the addition of IDF when nutrients were balanced, but increased when nutrients were allowed to float. The addition of IDF decreased the ATTD of DM, GE, IDF, TDF, and NDF. In contrast, the ATTD of SDF increased with the addition of IDF. The ATTD of AEE decreased with the addition of IDF when nutrients were

balanced, but increased when nutrients were allowed to float. Estimates of the effect of IDF on the AID of DM, GE, starch, SDF, and ADF were similar between CN and CI. In contrast, estimates of the AID of IDF, TDF and NDF were smaller for CN than CI ($P < 0.050$). Estimates of the effect of IDF on the ATTD of GE and SDF were similar between CN and CI. In contrast, the estimates of the effect of IDF on of the ATTD of DM, IDF and TDF were greater for CI than CN ($P < 0.050$) and tended to be greater for CI than CN for the ATTD of NDF ($P = 0.053$). In experiment 2, a total of 480 weaned pigs (6.80 ± 0.18 kg BW) were allotted to 48 pens. At 14 days post-weaning, for the next 21 days, pigs received 8 dietary treatments: a series of 4 corn-soybean meal based diets with 4 levels of added phytase (0, 109, 218, and 327 FTU/kg; Quantum Blue 5 G, AB Vista, Wiltshire, UK;) and a second series of 4 diets, based on corn, soybean meal and 20% bran with the same 4 levels of added phytase (0, 109, 218, and 327 FTU/kg). Titanium dioxide was added to the diet at 0.4% as an indigestible marker. Pigs were blocked by BW and allotted to pens, with 6 pens per treatment. On day 21, one pig representing the average BW for each pen was euthanized, and fibulas were collected and analyzed for bone ash. Fecal samples were collected from each pen on days 18-20. Adding phytase increased ADG ($P < 0.001$), while insoluble fiber decreased ADG ($P = 0.033$). There were no effects of phytase or insoluble fiber on ADFI ($P = 0.381$ and $P = 0.632$, respectively). Phytase improved G:F ratio ($P < 0.001$), while insoluble fiber tended to decrease G:F ratio ($P = 0.097$). Phytase increased bone ash ($P = 0.005$), but there was no effect of insoluble fiber ($P = 0.949$). Phytase did not affect the ATTD of DM, NDF, or ADF ($P > 0.050$) while insoluble fiber decreased the ATTD of DM ($P < 0.001$), NDF ($P < 0.001$) and ADF ($P < 0.001$). There were no interactions between fiber and phytase in any of the variables evaluated ($P > 0.050$). In conclusion, the addition of IDF decreased the use of most of the dietary components. However, adding IDF increased fermentation of SDF in the large intestine. Letting nutrients float can result in greater estimates for digestibility of fiber components related to insoluble fiber. Additionally, letting nutrients float is an inconvenient method when fat digestibility is evaluated since fat level confounds the response to IDF. The addition of insoluble fiber did not affect the ability of phytase to improve growth performance and bone mineralization.