

ENVIRONMENT

Title: Evaluation of Emerging Technologies in Swine Manure Management - NPB # 02-097

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Abstract: The study was designed to determine the performance and carcass characteristics of wean to finish pigs fed diets with different fermentable carbohydrate sources (inulin and sugar beet pulp). Six hundred and forty early weaned (17-d old, BW=5.7±0.11kg) pigs were housed in an environmentally controlled facility from wean to finish. The duration of the study was divided into five phases: 5.7 to 10; 10 to 20; 20 to 50; 50 to 90; 90 to 115kg BW. Pigs were blocked by initial body weight and allotted to four dietary treatments: (1) corn soybean meal control diet (CON); (2) CON diet supplemented with inulin in drinking water providing 2 to 3 g·d⁻¹ inulin for each pig (INU); (3) ground sugar beet pulp with inclusion rate of 5%, 7%, 9%, 12% and 12% in Phases 1, 2, 3, 4 and 5, respectively (SBP); (4) CON diet supplemented with antibiotics (ASP250, Alpharma, Chicago, IL) 0.25% in Phases 1 through 3 and 0.0% in Phases 4 and 5. Blood samples were collected from six pigs per treatment in Phases 3 through 5 and analyzed for plasma urea nitrogen (PUN) and plasma insulin-like growth factor-I (IGF-I). Nutrient digestibilities were measured with eight animals per treatment during Phases 2 through 4. Chromic Oxide was used as an inert marker. In addition, fecal samples from six pigs per dietary treatment were collected at the end of Phases 3 and 4 for determination of prevalence of microorganisms.

Pigs in AB group grew faster ($P < 0.01$) and had higher feed intake ($P < 0.01$) than the other treatment groups in Phases 1 through 3. Gain to Feed ratio was negatively influenced ($P < 0.01$) by sugar beet pulp and inulin supplementation in Phase 1 and by SBP in Phase 2. Inulin supplementation in drinking water tended to improve ($P = 0.30$) growth rate during Phases 1 through 3 compared to the CON group. In Phase 4, increased growth rate was observed in pigs supplemented with inulin in water (1021, 1054, 1026, 1002 g/d for CON, INU, SBP and AB groups, respectively; s.e. = 9.79; $P < 0.01$). In Phase 5, there was no difference in growth performance among treatment groups. Nutrient digestibilities were measured during Phases 2 through 4. Organic matter and nitrogen digestibilities were lower ($P < 0.05$) during Phases 2 through 4, whereas phosphorus digestibility was higher ($P < 0.05$) during Phases 2 and 4 in SBP group. The concentration of PUN was lower ($P < 0.05$) for the SBP group than other treatment groups during Phases 3 through 5. There was no dietary effect on IGF-I concentration.

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Supplementation of AB resulted in lower ($P < 0.01$) total aerobic and anaerobic bacteria and bifidobacteria in pig feces in Phase 3. Dietary treatments had no effect on prevalence of *E. coli* and *Lactobacillus*. The withdrawal of AB and inulin supplementation in Phase 4 resulted in an increase ($P < 0.01$) in total aerobes and anaerobes. *Lactobacillus* was lower ($P < 0.01$) in the CON and INU groups compared to SBP and AB groups. There were no dietary effect on the prevalence of *E. Coli* and bifidobacteria in Phase 4. Post-slaughter carcass characteristics, including average fat depth, average loin depth, lean percentage and carcass grade premium, were not influenced by the dietary treatments except dressing percentage, which was lower for the SBP group (74.4%, 74.4%, 73.4% and 74.6% for CON, INU, SBP and AB, respectively; s.e. =0.29; $P=0.02$).

In conclusion, supplementation of inulin in water improved pig performance during the late growth stage. Sugar beet pulp supplementation reduced nitrogen but increased phosphorus digestibility. Antibiotic supplementation reduced the prevalence of anaerobes and aerobes in pig feces. Carcass dressing percentage was reduced by SBP supplementation.