Swine Liquid Feeding: Research Update

C. Zhu, D. Woods, D. Columbus, S. Niven and C.F.M. de Lange[1]
Dept. of Animal and Poultry Science, University of Guelph
[1]Tel: (519) 824-4120 ext. 56477, Fax: (519) 836-9873, Email: cdelange@uoguelph.ca

Objectives

A three-year research program is underway to explore the value of swine liquid feeding under Ontario conditions. Over the last year we have explored the use of high moisture corn and corn steep water in liquid feeding of grower-finisher pigs, and the use of condensed whey permeate in starter pig diets.

Introduction

Currently about 20% of grower-finisher pigs in Ontario are raised using computerized liquid feeding systems. As the extent of swine liquid feeding and the use of co-products from the food and fuel industry in swine feeds are likely to increase, more information on swine liquid feeding practices in Ontario is needed. For this reason the Swine Liquid Feeding Association (SLFA) has been formed and a state-of-the art swine liquid feeding system has been installed at the University of Guelph. Further information and previous research findings are posted on the website of the SLFA (www.slfa.ca).

Recent research findings

In a growth performance study, we showed that liquid fed grower-finisher pigs fed high moisture corn and soybean meal based diets, performed just as well as pigs fed dry corn and soybean meal based using conventional dry feeders. In this study we did not observe a clear advantage of liquid feeding of grower-finisher pigs. An area of further study has been **phosphorus (P) availability in high moisture corn**. In dry corn about 70% of P is tied up in phytate, which renders P poorly available to pigs. However, during storage of high moisture corn some fermentation occurs, which may result in degradation of phytate and thus in increased P availability. These changes in P availability have not been well characterized. In our studies, we observed similar levels of total P content in high moisture and dry corn (0.30% in dry matter), but a much high content of soluble phosphorus, indicative of phytate phosphorus degradation, in high moisture corn (50% of total P) than in dry corn (10% of total P). This suggests that the availability of P in high moisture corn is higher (about 50%) than that in dry corn (15%). As a result, the fortification of stored high moisture corn based diets with inorganic P can be reduced, reducing feed costs as well as P excretion with manure. Of interest was also the rapid and substantial release of phytate P when high moisture corn was steeped with phytase. When mixed with water in a 2 to 1 ratio and at a temperature of 21 ^{0}C, close to 50% of phytate P was released within about 2 h; when increasing the temperature and duration of steeping phytate P release was nearly complete. This demonstrates that the use of phytase in liquid swine feeding, and when the feed is allowed to steep, is likely to be more effective than in dry feeding systems. We are currently exploring this further in pig performance studies.

Corn steep water (CSW) is a co-product from the starch and syrup industry. It has a pH of about 4.0. CSW contains about 45% dry matter, and - on a dry matter basis – 50% crude protein, 20% lactic acid, 18.0% ash, 5.1% potassium, 3.3% phosphorus (about 70% of

this is unavailable phytate phosphorus) and 0.08% calcium. The high lactic acid content of CSW can provide benefits to pigs, because of its anti-microbial properties and its stimulatory effects on gut development. Several years ago, attempts to incorporate CSW into liquid swine feeds were not successful. The reason for this is unclear and may be related to corn mycotoxins that will accumulate in CSW. In pilot finisher pig performance studies, we observed no negative effects of feeding CSW, at 5 and 10% of feed dry matter, to finisher pigs. In fact, at the 5% inclusion level we observed slightly positive effects on growth rate (1.17 versus 1.09 kg/d) and feed efficiency (feed/gain: 2.30 versus 2.46). The reason for the slight reductions in growth rate (1.06 kg/d) and feed:gain (2.45) at the 10% dietary inclusion level may be attributed to the high phytate phosphorus and sulfur content in CDS and is being explored further.

In a starter pig study, we compared (1) a conventional dry feeding program, (2) liquid feeding the conventional dry feed, and (3) liquid feeding where all whey was removed from the dry feed and replaced with 20% **condensed liquid whey permeate** on a dry matter basis. Pigs were introduced to the dietary treatments at weaning (17 to 21 days of age; average body weight 5.76 kg) and not fed any in-feed antibiotics in any of the treatments. Liquid feeding was computer controlled and based on 6 feedings per day; no feed was delivered when the previous meal was not consumed completely, monitored by sensors in each individual trough. In this experiment, pigs performed well on all treatments. Best performance was observed for dry feeding, likely because of feed intake restriction in liquid fed pigs. Among the liquid fed groups, body weight gain was improved when whey permeate was included in the diet (375 vs 344 g/d during the first 6 weeks post-weaning). Additional analyses are underway to assess pig behavior, nutrient digestibility and gut health.

Summary and implications

Liquid feeding of swine is gaining in popularity in Ontario as it represents a means to improve various aspects of pork production, and to reduce pork production costs in particular. Current studies indicate that the availability of phosphorus in high moisture corn is higher than that in dry corn, P availability in corn can be enhanced further by steeping with phytase, corn steep water (CSW) has the potential to be an effective pig feed ingredient, and that the inclusion of liquid whey permeate in the diet slightly enhances starter pig performance.

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