Impact of Ingredients (including Zero-Tannin Faba Bean) in Swine Diets on Digestibility, Performance, Water Intake and Manure Output

Carole Furedi, The Puratone Corporation

Swine producers are always looking to improve the diets fed to their pigs as feed accounts for 70% of the cost of growing a pig. Diets deliver energy, protein and minerals (eg. phosphorus, calcium, potassium, etc.) to growing animals and swine nutritionists are always on the lookout for ingredients that provide high levels of these components. The gold standard of ingredients is corn and soybean meal (SBM) because of their nutrient profiles and availability, however the bulk of these two ingredients are imported into Manitoba. Lately, dried distiller's grain with soluble (DDGS), a by-product of ethanol production, has been replacing corn and SBM in swine diets because of its lower cost and high energy and protein levels. Again corn is the gold standard with DDGS derived from corn prized over DDGS derived from other parent grains. Most corn-DDGS is produced in the U.S. and so the bulk of this ingredient is imported as well. By importing ingredients into this province foreign nutrients are being added to the nutrient load of the soil. Ideally nutrients should cycle through the environment with limited importation. The use of locally grown ingredients would minimize the importation of nutrients into the province.

Zero-Tannin Faba Beans (ZTFB) (variety: Snowbird) were reported to be a viable substitute for SBM by the Prairie Swine Centre (PSC). They found that ZTFB has a high protein (28%) and available energy (44% starch) content rivaling that of corn-DDGS (26% crude protein) and corn (65% starch). Although there were no differences in pig growth in the studies published by PSC they admitted there was a need to run a commercial scale trial. With funding from Manitoba Pulse Growers Association, Manitoba Rural Adaptation Council, Manitoba Livestock Manure Management Initiative and the National Research Council's IRAP, Puratone began a study to investigate the feasibility of substituting ZTFB in place of some SBM in our finishing pig rations. We also wanted to compare imported corn-DDGS with local corn-wheat DDGS from the Husky Oil plant in Minnedosa, Manitoba.

An initial digestibility and metabolism study at the University of Manitoba's Animal Science Department (Faculty of Agricultural and Food Sciences) confirmed the values suggested by the other studies. The Snowbird ZTFB used in our study had a high crude protein and metabolizable energy (the energy that can actually be used by the animal) and placed it as a desirable ingredient for swine diet formulation (Table 1). Armed with this information we began a commercial scale research trial in our 2,500-head research finishing barn with diets containing either 15% or 0% ZTFB and one of the two DDGS sources (corn or corn-wheat) at 10% or 30% inclusion in the diet. We also added a fourth factor that would see whether the inclusion of a yucca plant extract (in our case we used Micro-Aid by DPI) would increase the digestibility of any of these ingredients and thus improve pig performance.

We found no difference in pig growth, feed efficiency, carcass characteristics or carcass value between the two sources of DDGS. Pigs fed diets containing 30% DDGS grew more slowly, were less efficient and spent more time in the barn than pigs fed diets containing 10%; however, the standardized feed cost per kilogram of body weight gain ($/kg gain) was $0.024 lower ($2.16/pig) with the higher DDGS inclusion.

Pigs fed diets containing 15% ZTFB had similar growth to pigs fed diets with 0% ZTFB but the $/kg gain was $0.022 higher when ZTFB was in the diet. This equates to an added cost of $2 per pig (average gain 90kg/pig) and there were no improvements in carcass value to balance this extra cost. However, when Micro-Aid was added to the diets containing ZTFB, the $/kg gain dropped to the same as diets without ZTFB (Figure 1).

This interaction between Micro-Aid and ZTFB has not been documented before; however, yucca extract (like Micro-Aid) has been previously shown to promote gut health and the growth of beneficial bacteria while inhibiting the growth of harmful bacteria in the gut. The beneficial bacteria serve to break down fibre in the intestine and diets containing 15% ZTFB had higher crude fibre than diets without ZTFB. Pigs eat to meet their caloric needs and a diet that is high in fibre will be bulkier and gut fill might limit intake before the caloric requirements needed to sustain fast growth are met. Therefore, beneficial bacteria help by producing energy and amino acids, while breaking down the fibre, which can be used by the pig for growth. Another added effect of adding yucca extract to diets is increasing absorption of nutrients by the intestine. All this helps to explain why adding Micro-Aid to diets containing ZTFB improved the performance and feed $/kg gain of finishing pigs. Therefore, ZTFB is a viable substitution for SBM in swine diets as long as a yucca extract such as Micro-Aid is also added.

Table 1. Nutrient profiles of corn and ZTFB

Item	Corn	ZTFB
Gross energy, kcal/kg	3974	3711
Digestible energy, kcal/kg	3961	3276
Metabolizable energy, kcal/kg	3877	3514
Crude protein, %	8.8	24.2
Crude fat, %	1.92	1.53
Total dietary fiber, %	9.0	10.1
Calcium, %	0.01	0.41
Phosphorus, %	0.26	0.62
Amino acids, %		
Cysteine	0.16	0.30
Isoleucine	0.26	0.94
Lysine	0.25	1.39
Methionine	0.16	0.16
Threonine	0.26	0.75
Valine	0.36	1.04

Figure 1. Average Daily Gain (ADG), Apparent Daily Feed Intake (ADFI), Feed Conversion Ratio (FCR) and feed cost per kg gain of pigs receiving diets containing 0% or 15% ZTFB and 0ppm or 62.5ppm Micro-Aid.