

Feed nutrient digestibility and growth performance of weaned pigs fed canola meal varying in nutritive quality

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Take Home Message

Imported soybean meal can be an expensive protein source. Feed inclusion of canola meal to replace 20 per cent soybean meal did not affect feed intake and weight gain of weaned pigs. However, quality can differ among canola meal samples that may result in differences in growth performance of pigs.

Feeding canola meal diets

Globally, canola meal is the second most fed protein source after soybean meal in swine production. In Canada, crushing canola seed generates four million tonnes of canola meal annually. Two decades ago, the recommended maximum feed inclusion rates of canola meal for starter, grower and finisher pigs were 8, 12 and 15 per cent, respectively. With advances in

plant breeding, modern canola meal contains much less glucosinolates than decades ago that permits greater dietary inclusion. Previously, we showed that canola meal replacing 20 per cent soybean meal in diets for weaned pigs did not affect growth performance. But at such high feed inclusion of canola meal, variation in quality, for example, glucosinolates content and protein quality can become a concern. Glucosinolates could reduce palatability of diets and feed intake and protein quality could affect availability of amino acids. Differences in crushing conditions among plants may also cause variation in quality of canola meal. Whether variation in quality translates into variation in nutrient digestibility and growth performance of young pigs remains unknown. We sampled canola meal from four crushing plants to establish diet apparent total tract digestibility of protein and energy and evaluate growth performance of weaned pigs fed 20 per cent canola meal to replace 20 per cent soybean meal. Diets were formulated to equal net energy (NE) value and standardised ileal digestible (SID) amino acids content.

Diets and nutrient profile of canola meal samples

A wheat-based soybean meal control diet and four diets containing 20 per cent canola meal were formulated by replacing soybean meal with four canola meal samples sourced from four different canola crushers in AB, SK and MB. The canola meal samples were processed from regular dark-seeded *Brassica napus* canola seed. Diets were formulated without antimicrobials or growth promoters to provide 2.3 Mcal NE/kg and 5.1 g SID lysine per Mcal NE. Other key amino acids were formulated as an ideal ratio to lysine. Fish meal and soy protein concentrate were included in all five diets at 5 per cent and 2.5 per cent, respectively. Diets were mixed and steam-pelleted at 70°C.

Canola meal samples contained 18.8–22.9 per cent total dietary fibre (vs 6.8 per cent for soybean meal), 3.1–3.8 per cent fat and 36.2–41.9 per cent protein. Consequently, dietary in-

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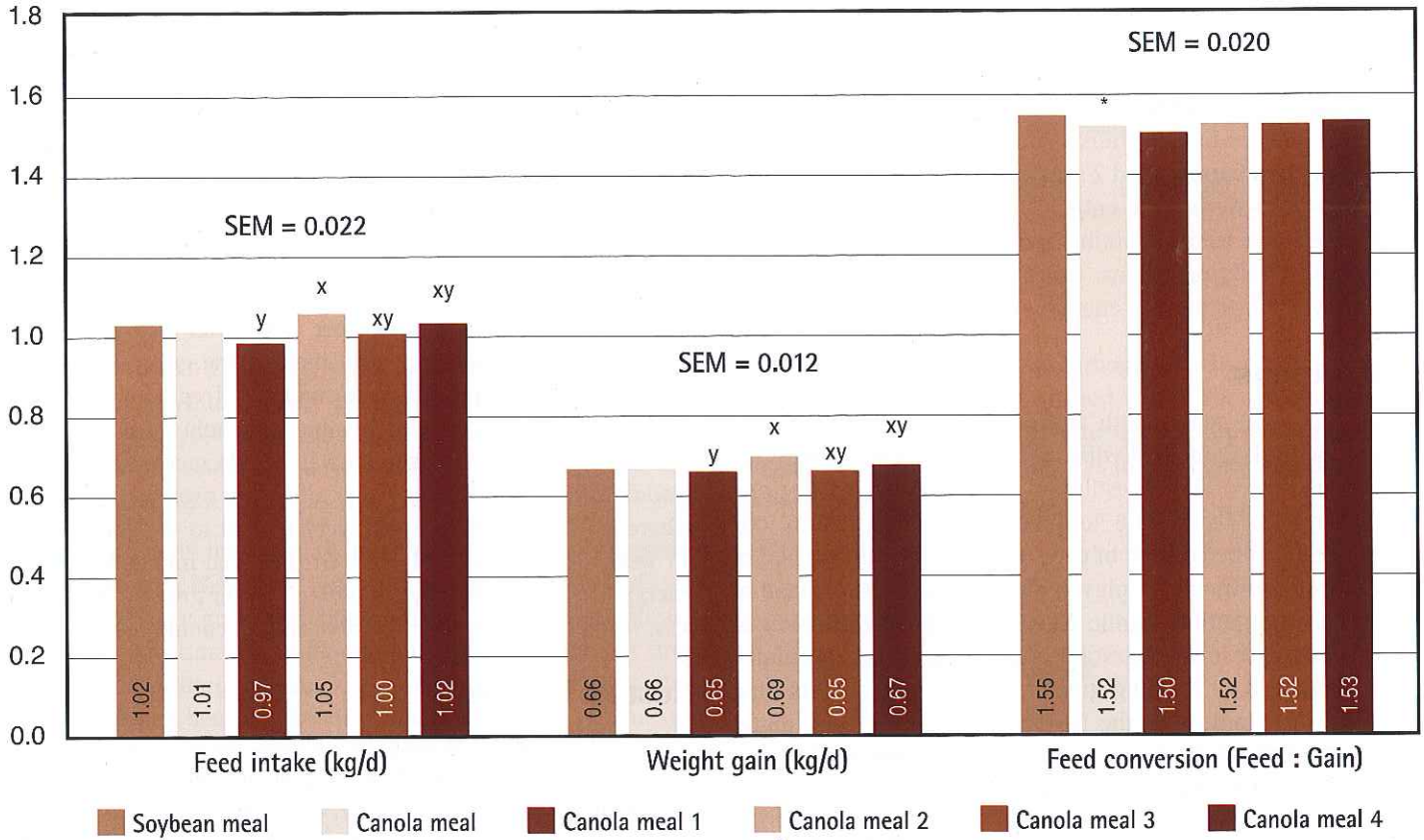
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Figure 1. Growth performance of weaned pigs fed diets containing canola meal in substitution for 20% soybean meal.



* Within each growth performance variable, the average of 4 canola meals differed from that of soybean meal (P < 0.05).

xy Within each growth performance variable, means of canola meal without a common superscript differed (P < 0.05).

clusion of 20 per cent canola meal to replace soybean meal increased dietary fibre and decreased dietary protein content. Chemically-available lysine content was close to total lysine content in the four canola meal samples, indicating that little protein damage occurred during desolventising (oil removal) and drying of the meal afterwards. Total glucosinolates content varied largely among the four canola meal samples, from 1.13 to 7.38 µmol/g. However, glucosinolate levels in diets containing 20 per cent canola meal remained below 2.4 µmol/

kg feed that growing pigs can tolerate without adverse effects on growth performance.

Weaned pig trial

The pig trial was conducted at the Swine Research and Technology Centre, University of Alberta (Edmonton, AB). In total, 240 pigs (initial BW: 9.6 kg; Duroc × Large White/Landrace F1; Hypor, Regina, SK) weaned at 19 ± one days of age were

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used in a four-week trial that started two weeks after weaning. At weaning, pigs were fed sequentially commercial pre-starter and starter diets (Hi-Pro Feeds, Sherwood Park, AB) for two and 12 days, respectively. Pens were then randomized to be fed one of the five test diets to achieve 12 pen-replicates per diet. Pigs were housed in three nursery rooms for a total of 60 pens containing two barrows and 2 gilts each. Pigs had free access to feed and water during the entire 28-day trial. Individual pigs, feed added and feed remaining were weighed weekly. Faeces were collected during the last two days on test to calculate digestibility of nutrients and energy.

Trial results

Pigs maintained good health and diarrhoea was not observed during the trial. Compared with soybean meal, canola meal inclusion decreased diet digestibility of dry matter, energy and protein by 3.3, 3.4 and 3.8 %-units, respectively, mainly due to the greater fibre content of canola meal. The hull fraction of canola seed is difficult for pigs to digest because 20 per cent of the hull is indigestible lignin. Nevertheless, with inclusion of oil to counteract lower digestibility of canola meal, calculated NE value was 0.02 Mcal/kg greater in canola meal diets than the SBM diet, indicating the NE value of canola meal might be greater than the book value used in diet formulation. Hulls in canola meal contain 15 per cent protein, but that protein

is tightly bound to fibre so it is difficult to digest, resulting in reduced protein digestibility. The lower protein content and digestibility of canola meal necessitate greater inclusion of synthetic amino acids in canola meal diets to meet the requirements. The variation of nutrient composition of canola meal was small, thus, digestibility of dry matter, energy and protein was similar among the four canola meal diets.

For growth performance, daily feed intake did not differ between pigs fed canola meal diets and pigs fed the soybean meal diet for the entire trial (day 1–28) and each week on test. Pigs fed canola meal diets had two per cent better feed conversion than pigs fed the soybean meal diet for the entire trial. Their maintained growth performance and better feed conversion was likely attributed to greater NE value of canola meal diets than soybean meal diet. Glucosinolates in canola meal samples were negatively correlated with feed intake of pigs for day 8–14, whereas feed intake was positively related to weight gain for all weeks for canola meal diets. Greater feed intake thus drove energy intake and thereby supported greater growth. Nevertheless, feed conversion did not differ among canola meal diets.

Cost vs. benefit


Prices per metric tonne were as follows: wheat, \$199; soybean meal, \$562; canola meal, \$355; soy protein concentrate, \$1,500; fish meal, \$1,616; canola oil, \$1,100; limestone, \$109; mono-/di-calcium phosphate, \$965; L-lysine-HCl, \$2,150; L-threonine, \$3,050; DL-methionine, \$5,850; L-tryptophan, \$14,000. Feed inclusion of canola meal to replace 20 per cent soybean meal decreased feed cost by \$5.23 per metric tonne of feed and decreased feed cost by 2.3 cents per kg of body weight gain. However, due to variation in quality among the four canola meal samples, the feed cost savings ranged from 1.8 to 3.2 cents per kg of body weight gain.

Recommendation

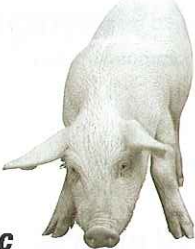
Despite the fact that it reduced diet protein and energy digestibility, results of this trial confirmed that feed inclusion of canola meal to replace soybean meal in diets for weaned pigs did not affect feed intake, weight gain and feed conversion. Producers should therefore consider including locally-produced canola meal to replace imported soybean meal in diets for weaned pigs to save feed cost. Among canola meal samples, feed intake and weight gain differed; thus, quality differences of canola meal sourced from different plants can affect growth performance of pigs.

Acknowledgements

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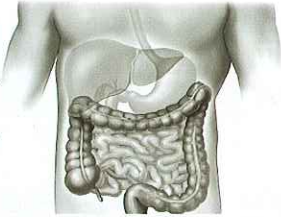
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