

Response of growing hogs to the inclusion of hybrid rye in low or high energy diets

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Take home messages

- Consider increasing the NE level of the first phase diet in the grower-finisher to avoid a reduction in growth performance when feeding 40% hybrid rye.
- Overall, hogs can handle 40% hybrid rye throughout the grower-finisher very well.
- A good strategy to save money on feed costs in grower-finisher would be to reduce the dietary NE level, as long as hogs can increase their feed intake to make up for the reduced energy level.

Why look at energy level in hybrid rye diets?

Long term sustainability of the livestock industries in the Canadian Prairies is dependent on reduced reliance on grains grown primarily for human consumption and increased use of alternative feeds and by-products. One such example is rye, a cereal crop comparable to wheat. Although the rye market

in Canada is small relative to other crops, new rye hybrids with improved yield potential of 25 to 30% higher than older varieties has resulted in increasing acreages planted in Saskatchewan and Alberta, making them competitive as a feed grain. The new hybrid varieties (developed by KWS in Germany) not only have increased yields but have improved grain quality and are more resistant to ergot.

Net energy (NE), standardized ileal digestible (SID) lysine content, and price of rye are intermediate to those of wheat and barley. Hybrid rye also contains large amounts of highly digestible starch and similar amounts of SID amino acids and standardized total tract digestible P as corn, suggesting that rye has the potential to be a cost-effective ingredient in swine diets. Recent research has demonstrated that the new hybrid rye varieties can replace wheat or corn in diets fed to growing hogs with minor effects on growth performance or carcass traits. Several studies observed slightly reduced feed intake for pigs fed increasing hybrid rye substituting for wheat or corn, which in turn resulted in lower average daily weight gain. Typically, the growing pig will eat to meet their energy requirements, meaning that for diets with a high energy value a lower daily feed intake is needed to maintain growth performance. The current experiment was

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designed to determine if an increased dietary energy content will compensate for reduced feed intake of pigs fed diets formulated with rye substituting for wheat.

Our objective was to determine the effects of 40% hybrid rye inclusion in diets formulated to be either low or high NE on growth, feed intake, and energy digestibility of growing hogs. We hypothesized that growing-finishing hogs fed 40% hybrid rye would perform better on the high than the low energy diets.

Hog trial setup

A total, 80 barrows and 80 gilts (~70 kg or 154 lb) were placed into 2 rooms, 16 pens per room, 5 pigs per pen. Pens were equipped with one dry feeder and a nipple drinker located at the back of the pen. Pens were randomly allocated to be fed diets with either 0% or 40% hybrid rye replacing wheat, and with either low (2350 kcal) or high (2450 kcal) NE per kg of diet, resulting in 4 treatments and n = 8 pens per treatment. Hybrid rye fed in this trial was the variety 'KWS Bono' developed by KWS LOCHOW GMBH (Bergen, Germany) and obtained from FP Genetics Regina, SK. The low energy diets were formulated to have similar dietary inclusion levels of all major ingredients compared to the high energy diets, except for a decreased inclusion of canola oil. Test diets were fed to slaughter weight over 2 growth phases (Phase 1; 70 to 85 kg BW; Phase 2; 85 to 130 kg BW). Pigs had free access to water and the assigned test diet in pelleted form.

As part of our study design, we will followed pigs from birth to slaughter. Provided that a marked improvement on the stress resilience, performance, or welfare of the pig is seen, the treatments implemented in the study could potentially serve as functional modifications to swine housing in production settings.

What we found

The hybrid rye fed in this experiment had relatively low levels of mycotoxins, including ergot. Energy digestibility was unaffected by rye inclusion and was reduced in the low relative to the high energy diets.

For the first 8 days of the trial (Figure 1), hybrid rye inclusion resulted in decreased feed intake. The reduction in feed intake with the hybrid rye diets was greater in the low vs. the high NE diets (reduction of 0.18 vs. 0.07 g/d, respectively). Feed efficiency (G:F) was also reduced in hogs fed the low energy rye diet, resulting in less weight gain than hogs fed one of the other three diets, and lower body weight on d 8. In the next 9 days (d 8 – 17), hogs on the low energy hybrid rye diets had numerically the lowest feed intake and feed efficiency, resulting again in lower weight gain and lower body weight on d 17. For the next growth period (d 17 to 28), the opposite happened with pigs fed the low energy rye diet gaining the most weight and having the best feed efficiency. Body weight was still a bit lower for the low energy rye diets compared to other



Photo: Grow-finish research room at PSC

diets on d 28. There was no effect of rye inclusion or NE level on weight gain after d 28, and body weight on d 43 and d 50 was no longer different among the treatments (Figure 2).

Looking at the overall results for the entire trial (d 0 to 50; Figure 3), pigs fed the low energy rye diets gained 77 g/d less than those fed the high energy rye diet or the low energy diet without rye. Overall feed intake was not affected by hybrid rye inclusion or NE level. Net energy intake was consistently greater for pigs fed diets with rye compared to those fed diets without rye. Overall feed efficiency was reduced in pigs fed rye diets compared to those fed diets without rye, but was not affected by NE level.

What these results mean

Pigs were fed wheat-based diets before the start of the trial, so it is possible that the reduced feed intake with the rye diets in the first 8 days of the trial was due to pigs needing to adapt to hybrid rye, however, this does not explain the differential response to the high and low energy diets. The decreased feed intake may have also partially been due to the greater dietary fibre content in rye that mostly consists of complex gummy sugars, which may increase gut fill and which can hold more water in the gut. This then limits the ability of especially younger pigs to consume more feed.

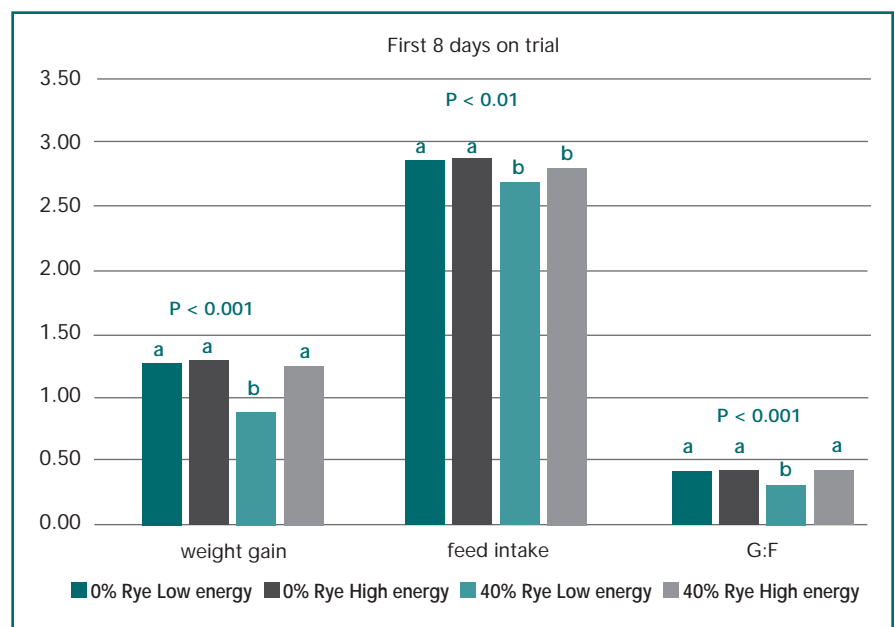


Figure 1. Growth performance in the first 8 days on trial of pigs fed 0 or 40% hybrid rye with low (2350 Mcal) or high (2450 Mcal) net energy

We had expected that hogs fed the high energy rye diets would grow better than those fed the low energy rye diets. This was indeed the case in the first 17 days of the trial. The higher NE level helped hogs on the hybrid rye diets compensate for the lower growth rate due to the rye, and daily gain was not different for pigs fed the high NE hybrid rye diet compared to pigs fed the low or high NE wheat control diets. It was interesting to see during the d 17 to 28 period that hogs fed the low NE hybrid rye diets showed the greatest weight gain and best feed efficiency of all diets, perhaps indicating compensatory gain happened. After d 28, there was no longer an effect of hybrid rye inclusion or NE level on weight gain or BW. Altogether, our data show that in younger animals the NE level of the diet may need to be considered when formulating diets including hybrid rye, but that overall, pigs can handle 40% hybrid rye throughout the grower-finisher phase very well.

Due to its lower NE value, when hybrid rye is replacing wheat in the diet the oil inclusion level needs to be increased. As a result, the price of not only wheat and hybrid rye but also of oil needs to be considered when deciding if it makes sense to feed hybrid rye. For this trial, we calculated the average cost of all ingredients between June and December 2022; wheat cost \$474, hybrid rye \$433, and canola oil \$2,420. In this scenario, the hybrid rye containing diets were on average \$7.73 per tonne cheaper than the wheat control diets for the low NE diets and \$3.35 per tonne cheaper for the high NE diets. This small difference in price did not result in changes in feed cost per hog. On the other hand, feed cost per kg BW gain tended to be \$0.04 higher for hogs fed hybrid rye vs. the wheat control diet, due to the lower overall feed efficiency for hogs fed the hybrid rye diets. The low NE wheat diets were on average \$38.96 per tonne cheaper than the high NE wheat diets, and the low NE rye diets were on average \$43.34 per tonne cheaper than the high NE rye diets. This large difference in feed cost per tonne translated to \$5.22 lower feed cost per pig and \$0.06 lower feed cost per kg BW gain for pigs fed low vs. high NE diets. This finding is in agreement with our previous research that has consistently shown lower feed cost per hog and per kg BW gain, as well as higher income subtracting feed cost when hogs are fed lower energy diets.

Conclusion

In conclusion, it may be useful to consider increasing the NE level of the first phase diet in the grower-finisher phase to avoid a reduction in growth performance when feeding 40% hybrid rye. After the first 17 days, pigs did well on the 40% hybrid rye diets regardless of the dietary NE level, resulting in similar feed intake and final body weight as hogs fed wheat diets. A good strategy to save money on feed costs in the grower-

finisher barn would be to reduce the dietary NE level, as long as hogs can increase their feed intake to make up for the reduced energy level.

Thank you

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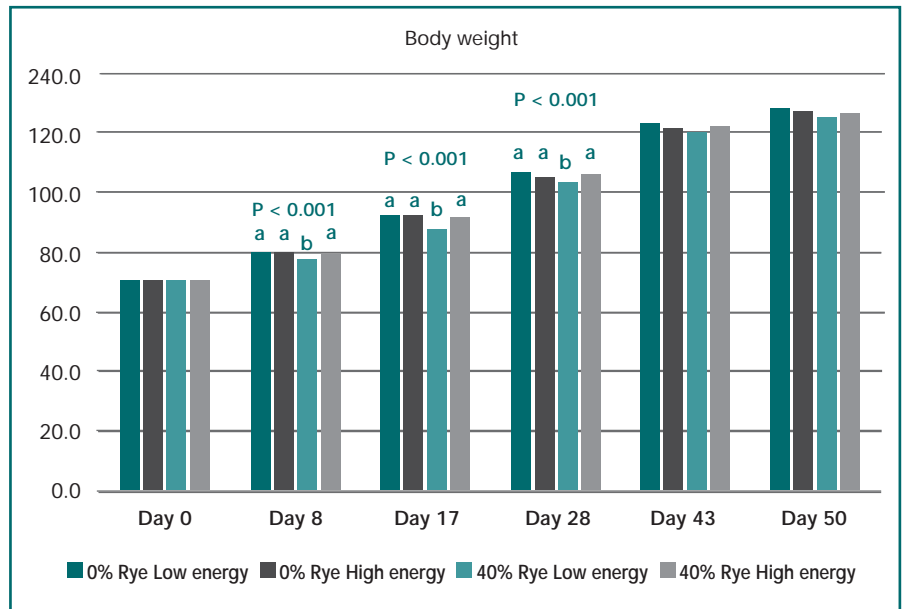


Figure 2. Body weight of pigs fed 0 or 40% hybrid rye with low (2350 Mcal) or high (2450 Mcal) net energy

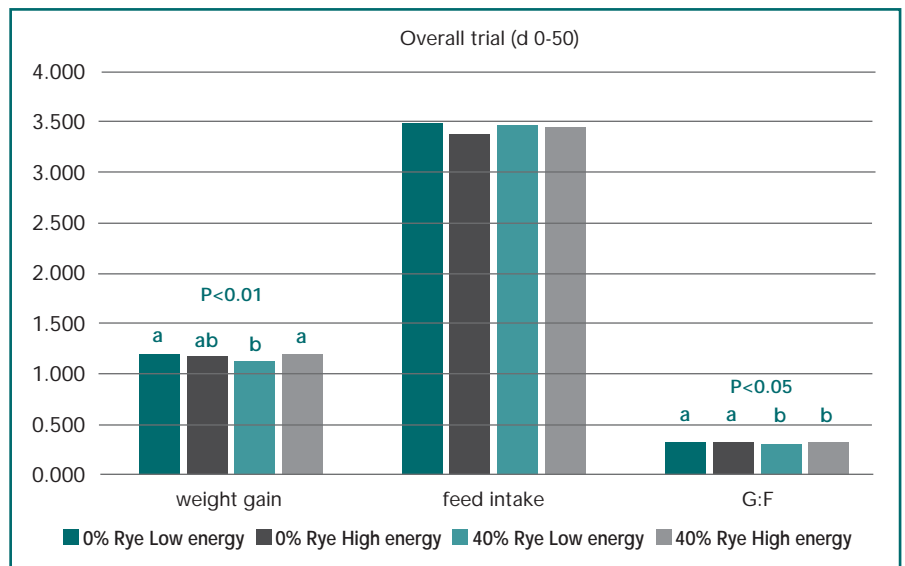


Figure 3. Overall (d 0 – 50) growth performance of pigs fed 0 or 40% hybrid rye with low (2350 Mcal) or high (2450 Mcal) net energy