Hybrid rye replacing wheat grain for hogs

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Take Home Messages

- **In a commercial scale growout trial, hybrid rye completely replaced wheat grain in diets without affecting feed efficiency, carcass traits, feed cost per hog or feed cost per kg of body weight gain, and profit per hog.**
- **Including feed NSP enzymes tended to improve weight gain over the entire trial.**
- **NSP enzyme inclusion improved feed efficiency, but only for hogs fed the all-rye replacing wheat diet.**
- **Assuming 2700 kg greater hybrid fall rye yield than wheat grain, an additional 13 hogs more (30 to 130kg live) could be fed per hectare (five more hogs per acre) at ~200 kg (440 lb) cereal grain intake per hog.**

Why hybrid rye?

Rye is a cereal crop similar to wheat. It is popular in northern and eastern European countries for the production of dark bread and food products. In Canada, rye is best known for the production of whisky and spirits. Its winter hardiness allows efficient use of spring runoff and extends the work season versus spring cereals for grain producers. Of ~324,000 hectares planted to rye in Canada, about 80 per cent grows in the prairie provinces. Rye has other uses in Europe including as grain stock for ethanol production, as forage/silage crop for ruminants and grain for pigs. What's new with rye in Canada is that novel European hybrid cultivars yield >30 per cent more over conventional rye, 15-20 per cent over barley and 20-40 per cent over wheat grain. Modern rye hybrids produce vast amounts of pollen that overwhelm the stigma. With the stigma oversaturated by pollen, mold spores have a lesser

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chance of infecting the ear before the stigma closes. Fall planted rye flowers earlier than spring planted cereals so ergot and fusarium contamination risk is lower. Not much rye is fed to pigs in Canada compared with corn, wheat and barley, or even triticale. But greater grain yield compared with wheat grain (80-120 vs. 40 – 80 bu/acre) was an attractive incentive for us to evaluate feeding hybrid fall rye to hogs even if that resulted in somewhat lower pig performance. Rye is known to have greater fibre content than wheat grain. But the fibre in rye grain is mostly complex gummy sugars, not bulky, woody hulls (bran). These complex soluble sugars could be made more digestible/fermentable to pigs by the inclusion of feed NSP enzymes. Prairie hog producers typically stock two cereal grains (barley, wheat), but not likely three. We decided to evaluate feeding increasing hybrid rye inclusions replacing wheat grain and test whether or not NSP enzymes would make the hybrid rye grain more digestible to hogs.

Commercial scale hog trial setup

We conducted this growout trial at a contract finishing barn located at Lougheed, Alberta that is part of the Sunhaven system. In total, 504 barrows and 504 gilts (Camborough Large White/Landrace ♀ x 380 ♂ (PIC Canada) were involved. As pigs arrived at the barn (~30 kg or 66 lb), they were herded into 48 pens by sex, 21 pigs per pen. Pens with slatted concrete flooring measured 20' x 8' providing 0.7 m^2/pig. Pens were equipped with one wet-dry feeder (Crystal Spring Hog Equipment, St. Agathe, MB, Canada) with two opposing feeding places located halfway along a dividing wall between pens. An additional water bowl drinker was located at the back of the pen. Pigs were initially fed a common Grower 1 diet. At ~44 kg (96 lb), pens were blocked by area of the rectangular room. Within area block, pens of barrows or gilts were randomly allocated to be fed diets with one of three hybrid rye levels replacing soft wheat grain – low rye (1/3rd of wheat replaced), medium rye (2/3rd of wheat replaced), or high rye (all wheat replaced). The fall rye was a hybrid cultivar named Bono (Figure 1) developed by KWS LOCHOW GMBH (Bergen, Germany) grown at Kalco Farms near Gibbons, AB. Diets were fed either with or without NSP enzyme (Endofeed WDC, 200 mg/kg) providing 1400 units/g β-glucanase and 4500 units/g xylanase donated by GNC Bioferm, Bradwell, Saskatchewan. Test diets were fed to slaughter weight (133 kg or 293 lb) over four growth phases (Grower 2 d 0-22, Grower 3 d 23-42, Finisher 1 d 43-63, Finisher 2 d 63 – slaughter). Pigs were slaughtered at Maple Leaf, Brandon, Manitoba.

Figure 1. Field of hybrid fall rye Bono growing in Western Canada. Photo courtesy FPGenetics, Regina, SK.

What we found

Body weight of hogs throughout the trial was not affected by either feeding increasing hybrid rye level replacing wheat grain or enzyme inclusion (Figure 2). For the entire trial (d 0-76), feeding increasing rye level replacing wheat grain reduced hog feed intake and weight gain, but feed efficiency was not affected (Figure 3). Enzyme inclusion did not affect feed intake and feed efficiency, but tended to increase overall weight gain by 20 g/d. Enzyme inclusion improved feed efficiency only for hogs fed the high rye level whereas it did not affect feed efficiency for hogs fed low or medium rye levels. Days on test to 130 kg slaughter weight or carcass traits were also not affected by feeding increasing rye level replacing wheat grain or enzyme inclusion (Figure 4). Feeding increasing rye level replacing wheat grain increased cost per tonne of feed, but did not affect feed cost per hog or per kg of body weight (Figure 5). Feed enzyme inclusion reduced feed cost per hog and per kg of body weight gain by CDN$1.70 and $0.02, respectively.

What these results mean

Because of the decrease in feed intake with increasing rye level replacing wheat grain, we first suspected mycotoxins or ergot alkaloids. Two labs tested both the hybrid rye and wheat grain and confirmed that these were not factors in reducing feed intake. We therefore believe that the decreased feed intake observed was possibly caused by the more complex sugars found in rye. Increasing gummy sugars content made the digesta

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Figure 2. Body weight of hogs on test days throughout the trial fed increasing hybrid rye level replacing wheat grain with or without enzyme.

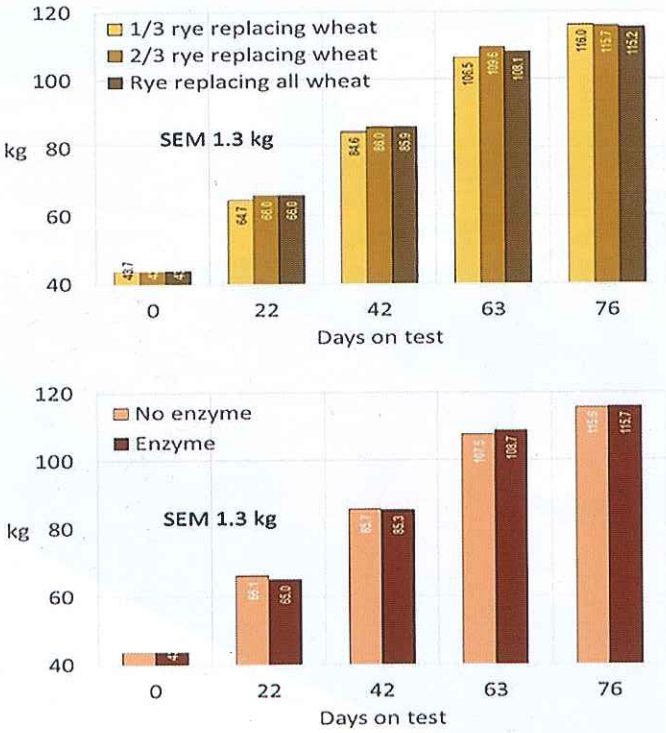
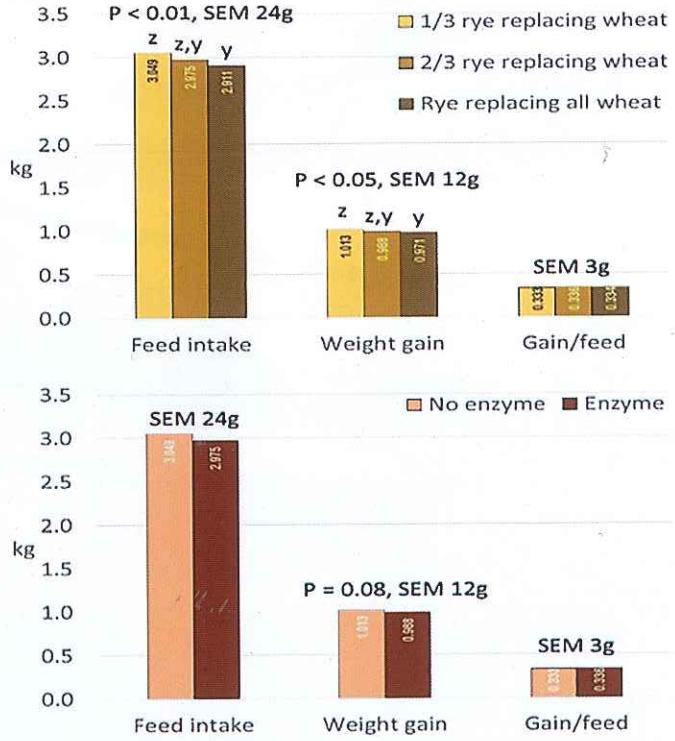


Figure 3. Daily growth performance (0 – 76d) of hogs fed increasing hybrid rye level replacing wheat grain with or without enzyme.



somewhat more viscous (held more water), slowing down passage rate through the gut. Hogs fed these less digestible complex sugars therefore felt more full and satisfied with slightly less feed thus reduced their weight gain. Because both feed intake and weight gain were reduced in parallel, feed efficiency was not affected. Feed NSP enzyme inclusion increased the digestibility/fermentability of the rye complex sugars, but that only showed up at the high rye level replacing wheat grain. The all-rye grain diet likely moved slower along the gut, staying longer and held the most water giving feed enzymes more time to breakdown the rye complex sugars. Carcass dressing was not reduced because the rye complex sugars were mostly soluble instead of bulky, insoluble cereal hulls (bran) so that did not increase gut weight or thickness. Backfat did not increase or decrease because we accounted for the greater rye complex sugars content as a lower net energy value for rye compared with wheat grain. Loin depth was also not affected because we correctly accounted for differences in amino acid (the chain links of protein) digestibility between rye and wheat

Figure 4. Carcass traits of hogs fed increasing hybrid rye level replacing wheat grain with or without enzyme.

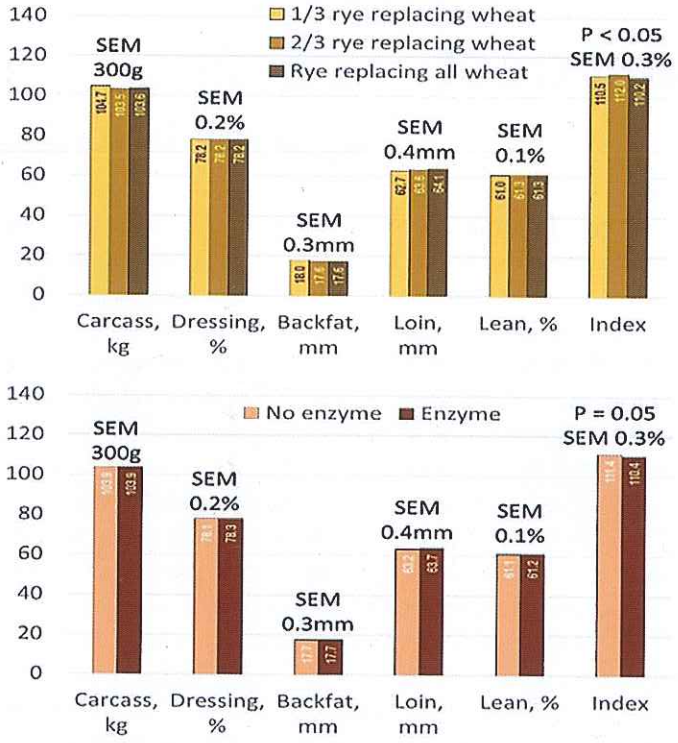
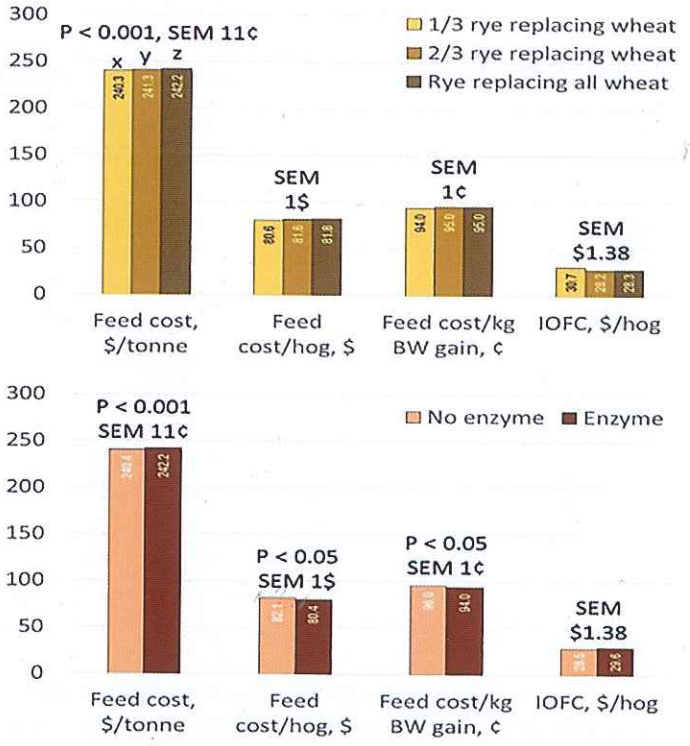


Figure 5. Overall cost vs. benefit of feeding increasing hybrid rye level replacing wheat grain with or without enzyme to hogs. Income over feed cost (IOFC) calculated as gross carcass revenue minus feed cost.



grain at formulating the diets. Diets with increasing rye level were more costly than wheat grain diets because oil was added to compensate for the lower net energy value of rye. Hybrid fall rye was sourced at $170 vs. $180 for wheat grain. Assuming hybrid fall rye yields 2,700 more kg/ha (40 more bu/acre) than wheat grain, using our trial results that would imply 691 more kg of lean pork/ha (617 more lb/acre) feeding 60 per cent rye inclusion replacing wheat grain from 43.7 to 132.7 kg slaughter weight (96 to 292 lb).

In conclusion, hybrid rye can completely replace wheat grain in growout hog diets without affecting feed efficiency, feed cost/hog or feed cost/kg of body weight gain. Inclusion of feed NSP enzymes would be recommended for diets containing high rye inclusion levels (45 – 65 per cent of the diet) to improve feed efficiency and weight gain. Assuming 2,700 kg greater hybrid fall rye yield than wheat grain, an additional 13 hogs more (30 to 130kg live) could be fed per hectare (5 more hogs fed per acre) at ~200 kg (441 lb) cereal grain intake per hog.

Thank you

We thank Tanya Hollinger, Neil and John Burden at the Dumloche test barn for care of the animals and smooth running of the trial. Thanks also to Lewisville Pork Farm for the use of their animals and Sunhaven Farms Milling for mixing and supplying the feed. ■