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Effects of replacing corn with triticale in diets for nursery and finishing pigs

Abstract

Two experiments were conducted to determine the effects of replacing corn (none, 1/3, 2/3, and all) with triticale on growth performance and nutrient digestibility in pigs. For the 34-d nursery experiment, 168 weanling pigs (avg initial weight of 14.8 lb and avg initial age of 21 d) were used. On d 24, fecal samples were collected to allow determination of nutrient digestibility. Overall, pigs consuming diets with 1/3 of the corn replaced with triticale improved ADG (cubic effect, P<0.08) and F/G (linear effect, P<0.01). Digestibility of DM, N, and GE were not affected (P>0.18). For the finishing experiment, 184 pigs (avg initial weight of 131 lb) were used, and fecal samples were collected on d 46. Overall, ADG (linear effect, P<0.02) and ADFI (linear effect, P<0.06) were decreased by 6% as replacement of corn with triticale was increased from none to 100%. But F/G and digestibility of nutrients were not affected (P>0.16), and the negative effects on ADG and ADFI were evident only at 2/3 replacement and replacement of all corn with triticale. In conclusion, replacing corn with triticale improved growth performance in nursery pigs, but reduced ADFI and, thus, ADG in finishing pigs, when more than 1/3 of the corn was replaced.; Swine Day, 2006, Kansas State University, Manhattan, KS, 2006

Keywords

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EFFECTS OF REPLACING CORN WITH TRITICALE IN DIETS FOR NURSERY AND FINISHING PIGS

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Summary

Two experiments were conducted to determine the effects of replacing corn (none, 1/3, 2/3, and all) with triticale on growth performance and nutrient digestibility in pigs. For the 34-d nursery experiment, 168 weanling pigs (avg initial weight of 14.8 lb and avg initial age of 21 d) were used. On d 24, fecal samples were collected to allow determination of nutrient digestibility. Overall, pigs consuming diets with 1/3 of the corn replaced with triticale improved ADG (cubic effect, $P<0.08$) and F/G (linear effect, $P<0.01$). Digestibility of DM, N, and GE were not affected ($P>0.18$). For the finishing experiment, 184 pigs (avg initial weight of 131 lb) were used, and fecal samples were collected on d 46. Overall, ADG (linear effect, $P<0.02$) and ADFI (linear effect, $P<0.06$) were decreased by 6% as replacement of corn with triticale was increased from none to 100%. But F/G and digestibility of nutrients were not affected ($P>0.16$), and the negative effects on ADG and ADFI were evident only at 2/3 replacement and replacement of all corn with triticale. In conclusion, replacing corn with triticale improved growth performance in nursery pigs, but reduced ADFI and, thus, ADG in finishing pigs, when more than 1/3 of the corn was replaced.

(Key Words: Triticale, Nursery Pigs, Finishing Pigs.)

Introduction

Triticale is a hybrid of wheat and rye that combines the protein and starch quality characteristics of wheat with the tolerance for harsh climates provided by rye. Resistance of triticale to drought is especially important because rainfall is limited in much of the world, and there is renewed interest in production of triticale in western Kansas. Thus, the objective of the experiments was to determine the effects of replacing corn with triticale on growth performance and nutrient digestibility in nursery and finishing pigs.

Procedures

Two experiments were conducted to determine the effects of replacing corn with triticale. In the first experiment, 168 weanling pigs (avg initial weight of 14.8 lb) were used in a 34-d growth assay. The pigs were sorted by sex and ancestry, blocked by weight, and allotted with 6 pigs per pen and 7 pens per treatment. The pigs were housed in an environmentally controlled nursery having 4 ft x 4 ft pens with woven-wire flooring. Each pen had a self feeder and nipple waterer so that feed and water could be consumed *ad libitum*. The control diet (Table 1) was based on corn-soybean meal and formulated to 1.8%, 1.6%, and 1.4% lysine for d 0 to 6, 6 to 20, and 20 to 34, respectively. Treatments were triticale added to the diet to replace none, 1/3, 2/3, and all of the corn.

For the last phase of the experiment (i.e., d 20 to 34), 0.25% chromic oxide was added to the diets as an indigestible marker. Feed and fecal samples were collected on d 24 of the growth assay and analyzed for DM, N, GE, and Cr to allow calculation of nutrient digestibility.

For the finishing experiment, 184 pigs (avg initial weight of 131 lb) were used in a 59-d growth assay. The pigs were sorted by sex and ancestry, blocked by weight, and allotted with 2 pens of 11 barrows and 2 pens of 12 gilts per treatment. The pigs were housed in a modified open-front facility having 6 ft x 16 ft pens with half slatted and half solid concrete floorings. Each pen had a self feeder and nipple waterer to allow *ad libitum* consumption of feed and water. The control diet (Table 2) was based on corn-soybean meal and formulated to 1.1% and 0.80% lysine for d 0 to 40 and 40 to 59, respectively. Treatments were triticale added to the diet to replace none, 1/3, 2/3, and all of the corn. Feed and fecal samples were collected on d 46 of the experiment and, as in the nursery experiment, analyzed for DM, N, GE, and Cr to allow calculation of nutrient digestibility.

All data were analyzed as randomized complete block designs by using the PROC MIXED procedure of SAS. Shape of the response to added triticale (linear, quadratic, and cubic) was determined with polynomial regression.

Results and Discussion

In nursery pigs, growth performance (ADG, ADFI, F/G) was not influenced ($P>0.28$) by replacing corn with triticale during d 0 to 6 (Table 3). For d 0 to 20 and d 0 to 34, however, pigs consuming diets with 1/3 of the corn replaced by triticale gained more weight (cubic effects, $P<0.02$ and $P<0.08$, respectively). Also, for d 0 to 34, there was a linear improvement ($P<0.01$) in F/G as triticale was used to replace corn.

From d 0 to 40 of the finishing experiment, triticale additions to the diets did not affect ($P>0.12$) ADG or ADFI (Table 4), but F/G was improved when triticale was used to replace 1/3 of the corn (quadratic effect, $P<0.05$). Overall (d 0 to 59), pigs tended to eat less (linear effect, $P<0.06$) and had reduced ADG (linear effect, $P<0.02$) as concentration of triticale was increased in the diet. But these effects were evident only when triticale was used to replace more than 1/3 of the corn.

In conclusion, our data suggested that replacing corn with triticale improved growth performance of nursery pigs, and had little effect on finishing pigs unless more than 1/3 of the corn was replaced. Thus, when the nursery and finishing are considered together, replacing a portion of the corn with triticale can be used to decrease diet costs and cost of gain when the price of triticale, relative to corn, warrants this type of substitution.

Table 1. Composition of Nursery Diets[a]

Ingredient, %	d 0 to 6	d 6 to 20	d 20 to 34
Corn [b]	26.50	40.42	61.18
Soybean meal (46.5% CP)	28.50	30.50	33.50
Dried whey	20.00	20.00	-
Lactose	10.00	-	-
Soy oil	2.00	1.00	1.00
Spray-dried plasma protein	6.00	-	-
Fish meal	3.00	5.00	-
Monocalcium phosphate	0.91	0.40	1.30
Limestone	0.91	0.56	1.20
Lysine-HCL	0.19	0.22	0.32
DL-methionine	0.23	0.17	0.15
Threonine	0.07	0.08	0.12
Salt	0.20	0.30	0.40
Vitamins	0.25	0.25	0.25
Minerals	0.15	0.15	0.15
Antibiotic [c]	0.70	0.70	0.10
Zinc oxide	0.39	0.25	-
Copper sulfate	-	-	0.08
Chromic oxide[d]	-	-	0.25

[a]Diets were formulated to 1.8% lysine, 0.9% Ca, and 0.8% P for d 0 to 6; 1.6% lysine, 0.8% Ca, and 0.7% P for d 6 to 20; and 1.4% lysine, 0.8% Ca, and 0.7% P for d 20 to 34.
[b]Triticale was use to replace none, 1/3, 2/3, and all of the corn on a lb/lb basis.
[c]To supply 140 g/ton oxytetracycline and 98 g/ton neomycin for d 0 to 6 and 6 to 20, and 40 g/ton of lincomycin for d 20 to 34.
[d]Indigestible marker top-dressed as 0.25% of the complete diet.

Table 2. Composition of Finishing Diets[a]

Ingredient, %	d 0 to 40	d 40 to 59
Corn[b]	70.07	81.28
Soybean meal (46.5% CP)	26.00	15.00
Soy oil	1.00	1.00
Monocalcium phosphate	0.82	0.82
Limestone	1.10	1.08
Lysine-HCL	0.19	0.18
DL-methionine	0.04	-
Threonine	0.08	0.03
Salt	0.35	0.30
Vitamins	0.15	0.13
Minerals	0.15	0.13
Antibiotic[c]	0.05	0.05
Chromic oxide[d]	-	0.25

[a]Diets were formulated to 1.1% lysine, 0.65% Ca, and 0.55% P for d 0 to 40, and 0.8% lysine, 0.6% Ca, and 0.5% P for d 40 to 59.
[b]Triticale was used to replace none, 1/3, 2/3, and all of the corn on a lb/lb basis.
[c]To supply 40 g/ton of tylosin.
[d]Indigestible marker top-dressed as 0.25% of the complete diet.

Table 3. Effects of Replacing Corn with Triticale on Growth Performance and Nutrient Digestibility in Nursery Pigs[a]

	Triticale					P Value		
Item	None	1/3	2/3	All	SE	Linear	Quadratic	Cubic
d 0 to 6								
ADG, lb	0.72	0.70	0.63	0.70	0.03	-	-	-
ADFI, lb	0.59	0.58	0.52	0.58	0.04	-	-	-
F/G	0.82	0.83	0.83	0.83	0.04	-	-	-
d 0 to 20								
ADG, lb	0.92	0.98	0.91	0.92	0.02	-	-	0.02
ADFI, lb	1.07	1.08	1.02	1.04	0.03	-	-	-
F/G	1.16	1.10	1.12	1.13	0.02	-	0. 10	-
d 0 to 34								
ADG, lb	1.16	1.22	1.18	1.21	0.02	-	-	0.08
ADFI, lb	1.56	1.60	1.53	1.56	0.03	-	-	0.15
F/G	1.34	1.31	1.30	1.29	0.01	0.01	-	-
Nutrient dig (d 24), %								
DM	82.2	82.5	83.3	82.9	0.9	-	-	-
GE	82.2	82.2	82.7	82.4	1.4	-	-	-
N	77.9	76.7	79.3	77.3	1.3	-	-	-

[a]A total of 168 pigs (initial weight of 14.8 lb), with 6 pigs per pen and 7 pens per treatment.

Table 4. Effects of Replacing Corn with Triticale on Growth Performance and Nutrient Digestibility in Finishing Pigs[a]

	Triticale					P Value		
Item	None	1/3	2/3	All	SE	Linear	Quadratic	Cubic
d 0 to 40								
ADG, lb	2.36	2.33	2.27	2.29	0.05	0.14	-	-
ADFI, lb	6.24	6.38	6.05	5.94	0.29	0.12	-	-
F/G	2.64	2.74	2.67	2.59	0.08	-	0.05	-
d 0 to 59								
ADG, lb	2.38	2.37	2.24	2.27	0.04	0.02	-	-
ADFI, lb	6.67	6.81	6.44	6.30	0.30	0.06	-	-
F/G	2.80	2.87	2.87	2.77	0.10	-	-	-
Nutrient dig (d 46), %								
DM	84.3	81.4	82.2	82.0	1.3	-	-	-
GE	84.3	82.1	82.0	82.2	1.2	-	-	-
N	79.4	76.0	77. 8	77.5	2.0	-	-	-

[a]A total of 184 pigs (initial weight of 131 lb), with 2 pens of 11 barrows and 2 pens of 12 gilts per treatment.