Oat Screenings: A Novel Swine Feedstuff

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Summary and Implications

The objective of the study was to evaluate ground oat screenings as a substitute dietary ingredient for wheat middlings in swine finishing diets. Due to the high fiber content of oat screenings, heavy finishing pigs were used in the trial.

Pigs fed diets containing 20% oat screenings grew slower and less efficiently than pigs fed either Basal diets or diets containing 20% wheat middlings ($P < 0.01$). Average daily feed intake was not different. Backfat depth was not different across treatments, but pigs fed 20% oat screenings had smaller loin muscle areas ($P = 0.0016$) as measured using digital ultrasound. Overall, if ground oat screenings have a consistent analysis and supply, it may become a valuable feed ingredient for finishing swine diets with proper supplementation. Additional research would help clarify its true feeding value for swine.

Introduction

Oat screenings consist of fines, pin oats, oat chips, and weed seeds and are the byproduct of cleaning oats. They are separated from the groat and ground as a feed ingredient. Analysis of the ground oat screenings is shown (Table 1).

Wheat middlings, or wheat midds, are a byproduct of wheat milling. About 70% of the grain becomes flour and the remaining 30% is wheat byproducts. A common byproduct is wheat midds. Midds are recommended at up to 25% of grow-finishing pig diets without negatively affecting daily gain or feed conversion. Although the bulk density of wheat midds is low (18 to 24 lb/cubic ft), they are used to enhance pelleting quality of swine feeds.

Oat screenings have more fiber and ash, and less protein, lysine, and phosphorus than wheat midds (Table 1). The calcium and fat contents are similar. Oat screenings have an even lower bulk density than wheat midds. Some of these oat screening values are estimated. Energy seems approximately equivalent, although with the higher ADF, so the energy usable to the pig may be lower than midds.

Energy-rich feedstuffs for pigs, especially corn, are increasingly expensive. New feedstuffs need to be evaluated to partially meet the feed energy needs of finishing pigs.

The objective of this study was to evaluate ground oat screenings as a substitute dietary ingredient for wheat middlings in swine finishing diets. Due to the high fiber content of oat screenings, heavy finishing pigs were used.

b1) a corn-soy diet (Basal); 2) 20% wheat midds (WM); and 3) 20% ground oat screenings (OS). The Basal and WM diets were formulated to meet NRC (2012) nutrient requirements. The OS diets substituted oat screenings for wheat midds equally on a weight basis (Table 2).

The trial had five replications of three pigs per pen with the three dietary treatments or 45 pigs. Each partially slatted pen (3.34 sq. m) had a 2-hole feeder and a nipple waterer. Crossbred barrows, initial body weight of 75 kg, were allotted to pens and pens were randomly assigned to 1 of 3 dietary treatments. Pigs were fed for 8 weeks. Prior to the trial, all pigs were fed a corn/soy diets.

At the beginning and end of the trial and at phase change all pigs were weighed and feed disappearance recorded. At the end of the trial, all pigs were scanned using digital ultrasound for backfat and loin muscle thickness.

Data were analyzed as a completely randomized design. Model included the fixed effect of dietary treatment (Basal, WM, or OS). Experimental unit was a pen of 3 pigs. Significance was declared at $P \leq 0.05$. When differences were observed, means were compared using Tukey's HSD.

Results and Discussion

Pigs fed diets containing 20% oat screenings grew slower and less efficiently than pigs fed either Basal diets or diets containing 20% wheat middlings ($P < 0.01$). Average daily feed intake was not different across treatments. Backfat depth was not different across treatments, but pigs fed 20% oat screenings had smaller loin muscle areas ($P = 0.0016$) as measured using digital ultrasound.

Based on calculated analysis, the 20% oat screening diet had 4 or 5% less ME than the corn on wheat midds diets. Because of the high fiber content of the oat screenings, the net energy was probably even lower for the oat screenings diets. Therefore, supplementation of an energy-dense feedstuff like fat or oil to the oat screenings diets may improve growth rate. The oat screenings diets were also 11 to 13% less in SID lysine than the corn or wheat midds diets. Thus, addition of crystalline amino acids may improve feed efficiency or loin muscle area. Pelleting oat screenings may improve fiber digestibility and palatability. Overall, if ground oat screenings have a consistent analysis and supply, it may become a valuable feed ingredient for finishing swine diets. Additional research would help clarify its true feeding value for swine.

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Table 1. Ground oat screening/wheat midds comparison.*

	Gr. oat screenings	Wheat midds
Dry matter, %	90.5	89.0
Cr. protein, %	9.2	15.8
Cr. fat, %	3.6	3.2
Cr. fiber, %	17.9	5.2
Ash, %	4.9	2.1
ME, kcal/lb	1,234	1,372
Ca, %	0.13	0.11
Tot. P, %	0.29	0.98
STTD P, %	0.11**	0.55
Tot. lysine, %	0.25**	0.65
SID lysine, %	0.19**	0.58
Bulk density lb/cubic ft.	18	21
ADF, %	25.2	6.0

*Values for oat screenings provided by laboratory analysis, Euorfins Scientific, Des Moines, IA unless noted as estimated. Wheat midds values from NRC, 2012.
**Estimated. For the lysine values of oat screenings, corn lysine values were used. For phosphorous STTD of oat screenings, the corn availability value was used.

Table 2. Composition and calculated analysis of diets by phase.

Treatment	Basal		WM		OS	
Phase	1	2	1	2	1	2
Corn	754.0	805.5	590.7	639.0	590.7	639.0
SBM	225.0	175.0	190.0	143.0	190.0	143.0
Wheat midds	0.0	0.0	200.0	200.0	0.0	0.0
Oat screenings	0.0	0.0	0.0	0.0	200.0	200.0
Monocal Phos	3.0	2.5	0.0	0.0	0.0	0.0
Limestone	10.5	9.5	11.8	10.5	11.8	10.5
Salt	3.5	3.5	3.5	3.5	3.5	3.5
Vit mix	2.5	2.5	2.5	2.5	2.5	2.5
TM Mix	1.2	1.2	1.2	1.2	1.2	1.2
Se Mix	0.3	0.3	0.3	0.3	0.3	0.3
	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
SID Lys	0.73	0.61	0.73	0.61	0.65	0.53
Cr. Protein	16.95	14.99	17.09	15.24	13.94	12.09
ME kcal/kg	3300	3311	3234	3343	3175	3183
Ca	0.66	0.56	0.65	0.54	0.65	0.49
Total P	0.42	0.39	0.48	0.46	0.35	0.33
STTD P	0.21	0.19	0.23	0.22	0.14	0.13

Table 3. Growth performance finishing pigs fed Basal corn-soybean meal diets or diets containing 20% wheat middlings (WM) or 20% oat screenings (OS).[1]

	Basal	WM	OS	SEM	*P*-value[2]
Pens[3]	6	6	6	—	—
Start weight, kg	72.56	73.37	73.29	2.29	0.9630
End weight, kg	137.01[x]	132.87[x,y]	126.96[y]	2.65	0.0521
ADG, kg/d	1.13[x]	1.04[x]	0.94[y]	0.02	0.0002
ADFI, kg/d	3.57	3.42	3.48	0.09	0.4850
G:F, kg/kg	0.32[x]	0.30[x]	0.27[y]	0.01	0.0001

[x,y]Means within a row lacking a common superscript letter are different ($P < 0.05$).
[1]Data are least square means.
[2]*P*-value for diet is based on ANOVA.
[3]Three barrows per pen.

Table 4. Scanned carcass characteristics and calculated lean growth performance of finishing pigs fed Basal corn-soybean meal diets or diets containing 20% wheat middlings (WM) or 20% oat screenings (OS).[1]

	Basal	WM	OS	SEM	*P*-value[2]
Pens[3]	6	6	6	—	—
Fat free lean, %	37.66	38.20	37.04	0.40	0.1572
Backfat depth, cm	0.87	0.77	0.79	0.04	0.2983
Loin muscle area, cm^2	23.07[x]	22.70[x]	20.57[y]	0.42	0.0016
Lean gain, kg/d	0.49	0.47	0.50	0.10	0.9828
Lean G:F, kg/kg	0.14	0.14	0.14	0.02	0.9950

[x,y] Means within a row lacking a common superscript letter are different ($P < 0.05$).
[1]Data are least square means.
[2]*P*-value for diet is based on ANOVA.
[3]Three barrows per pen.