

A Progress Report . . .

EVALUATION OF "PIGEON GRASS" SCREENINGS AS A COMPONENT OF RATIONS FOR GROWING-FINISHING PIGS

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Weather encountered during the 1974 cropping season was difficult for cereal grain production but appeared to promote the growth of weeds. Several farmers suggested that their harvest of weed seeds exceeded the amount of small grain combined. Yellow foxtail ("pigeon grass") was harvested in large quantities and frequently could be cleaned from the grain in nearly pure form. While analytical data are available, information concerning the actual feeding value of "pigeon grass" screenings was lacking. The data reported here provided information concerning the feeding value of "pigeon grass" for growing-finishing swine.

Weed seeds remain a "commodity" for which some means of disposal must be found after harvest. Where suitable for the specific weed seeds involved, fine grinding (to destroy viability of the seed) and subsequent use in livestock rations remains one of the most desirable options for North Dakota small grain producers. Salvage value for weed seeds has been obtained in this manner for many years, yet little actual information is available concerning the true worth of weed seeds in livestock rations. The series of swine and rat experiments reported here was intended to permit the evaluation of yellow foxtail ("pigeon grass") screenings in the rations of growing-finishing pigs.

Pigeon grass screenings have been suggested to contain a variety of materials which could be detrimental to the performance of young swine. Because of these "rumors" and the lack of real information, the initial evaluation of pigeon grass screenings was conducted with a limited number of rats. A basal ration containing 90 per cent barley and 10 per cent commercial swine supplement was formulated and pigeon grass screenings were substituted for barley on a weight-for-weight basis. Rations were formulated in which the *grain* was represented by 0, 20, 40, 60, 80 or 100 per cent pigeon grass screenings. Each ration was fed to one male and one female rat.

As no untoward effects were observed in the initial rat trial, an experiment with growing-

finishing swine was initiated, utilizing rations containing 0, 20, 40 or 60 per cent pigeon grass screenings. All rations contained 10 per cent complete swine supplement. Barley was added to make the rations total 100 per cent. The screenings were very finely ground and all rations were steam-pelleted without added binder. A portion of the experimental rations was removed near the midpoint of the swine experiment for use in a growth and digestibility trial with rats.

Each swine ration was fed to four male and two female weanling rats in a three-week growth and digestibility trial. Feces were collected during the second week of the experiment to determine the digestibility of the ration components.

Results and Discussion

The limited number of rats involved in the initial trial permitted quick evaluation but did not allow more than a preliminary evaluation. The most important result of this trial was the observation that high levels of "pigeon grass" were not toxic to the rats. This meant that the swine rations could contain reasonable levels of screenings.

The swine rations were formulated to be reasonably similar to those that would be used by commercial producers. The results of this experiment are presented in Table 1 and indicate that the screenings did not reduce performance until the dietary level of screenings exceeded 40 per cent of the total ration. Examination of the performance of

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Table 1. Performance of pigs fed levels of "pigeon grass screenings"

Item	% Screenings in rations ^a			
	0	20	40	60
No. of pigs	12	12	12	12
Avg. initial wt.	62.0	61.9	61.6	61.1
Avg. final wt.	219.8	202.7	224.3	207.4
Days on experiment	104	90	104	104
Avg. daily gain	1.52	1.56	1.57	1.41
Avg. daily feed	5.62	6.59	6.23	6.02
Avg. feed/gain	3.70	4.22	3.98	4.28
Feed cost/lb gain, cents	27.5	28.8	24.8	24.1

^aRations contained 10% complete swine supplement and 90% barley or barley-screening combination

the pigs fed the barley basal ration indicated that the barley used was of low quality. Weight gain of the pigs fed the rations containing 20 per cent or 40 per cent screenings was slightly greater than the rate of the pigs fed the control (barley) ration.

Table 1 also reveals that the pigs fed the ration containing 20 per cent screenings "consumed" more feed than pigs fed the barley or 40 per cent screenings rations, as feed data were not corrected for wastage and there was considerable wastage of the 20 per cent screenings rations.

These data definitely suggest that the upper limit for the use of screenings in rations for growing swine is between 40 per cent and 60 per cent of the ration if rate of gain is the major consideration. If feed cost per pound gain is the primary factor, the

upper limit of incorporation of screenings may be at least 60 per cent of the ration.

These concepts of upper limits are strengthened by previous research conducted at the North Dakota Agricultural Experiment Station (Dinusson, unpublished data). Weanling pigs were offered a ration containing 75 per cent pigeon grass seeds, 13 per cent "other" weed seeds (primarily wild oats) and 12 per cent complete supplement. The pigs in this earlier research refused to consume enough of the total ration to meet their maintenance requirements and lost weight, forcing termination of that feeding trial after an initial 14-day period. The pigs in the earlier study had an average initial weight of 35 pounds, while the pigs utilized in the research discussed in this report averaged 62 pounds, initially.

Table 2. Performance of rats fed swine rations containing "pigeon grass" screenings and digestibility ration components

Item	% Screenings in rations			
	0	20	40	60
performance				
Avg. daily gain, g	5.4	5.7	5.9	5.1
Avg. feed/gain	3.80	3.78	3.57	4.19
digestibility values				
Gross energy, Kcal/g	3.754	3.962	4.058	3.938
Energy digestibility, %	77.78	78.76	76.20	74.40
Digestible energy, Kcal/g	2.920	3.120	3.092	2.93
Digestibility of crude protein, %	78.34	77.63	76.97	77.07
Digestible protein in ration	12.2	12.7	12.9	13.4
Calcium digestibility, %	56.2	57.1	45.4	44.7
Phosphorus digestibility, %	60.3	58.3	54.1	52.5
Cell wall digestibility, % ^a	60.9	49.2	53.2	40.0

^aCell wall represents the total content of fibrous materials in the rations

Table 2 contains performance data and digestibility values for selected components for the swine rations when fed to rats. Note that the performance of the rats closely paralleled that of the pigs (see Table 1). Rats fed rations containing 20 per cent or 40 per cent screenings gained faster and more efficiently than those fed the basal barley ration, while performance of rats fed the ration containing 60 per cent screenings was inferior to the control ration.

The gross energy of the rations containing screenings exceeded that of the barley ration and the digestible energy content of the screenings rations equalled or exceeded that of the basal ration. Note, however, that the digestibility of gross energy appeared to decline with increasing level of the screenings in the rations.

Interestingly, the digestibility of crude protein was essentially constant, although the crude protein content of the rations was increasing with increasing levels of screenings (reflected by the increasing digestible protein observed in the rations).

Some of the digestibility values are not as encouraging as much of the data discussed previously. Calcium and phosphorus are the major minerals in swine rations and are used to produce a strong skeleton. The importance of calcium and phosphorus causes concern when it is observed that the digestibility of these minerals decreased as the level of screenings in the rations increased. "Cell wall" is an analytical determination which reflects the total level of the fibrous components of a feed or feedstuff and the digestibility of this fraction also decreased with increasing levels of screenings in the rations.

The only reservation associated with these data is related to the quality of the feed barley used in formulating the swine rations (these swine rations were used in the rats digestibility trial). This reservation is primarily associated with determining the value of screenings in rations for growing-finishing swine, expressed as a percentage of the value of barley.

The proximate composition of pigeon grass (yellow foxtail) has been presented previously (*N.D. Farm Research* 32 (1):15, 1974) and the analysis of the screenings utilized in this study is listed in Table 3. Pigeon grass seeds are high in fibrous components (which are inefficiently digested by non-ruminants), moderately high in protein, but contain low levels of lysine in relation to their protein content. Lysine is usually the first-limiting amino acid in swine rations.

Screenings, thereby, have moderate value in rations for growing-finishing swine when finely

Table 3. Chemical composition of the "pigeon grass" screenings¹

Item:	% of Screenings ²
Dry matter	92.2
Ash	7.37
Crude protein	17.2
Ether extract	3.8
Cell wall	36.4
Calcium	0.17
Phosphorus	0.41
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¹From: Hernandez, J.R., 1975. M.S. Thesis, NDSU
²All values except dry matter are expressed on a 100% dry matter basis.

ground. Producers should *not* grind screenings until immediately before use to prevent development of mustiness or off-flavors. Extremely fine grinding requires additional energy and time and thereby influences the dollar value of the *intact* screenings.

Summary

Finely ground "screenings" which were almost pure samples of yellow foxtail ("pigeon grass") were evaluated as a replacement for barley in rations for growing-finishing swine. Rats also were used to evaluate the digestibility of ration components. All swine rations were pelleted.

Use of screenings as 20 per cent or 40 per cent of the ration produced performance which was slightly superior to that obtained on barley-based control ration. The barley was noted, by animal performance and digestible energy content, to be of relatively low quality. Substitution of screenings for this barley at a level of 60 per cent of the ration reduced performance but produced the most economical gains in the growing-finishing swine experiment.

When used at a level not exceeding 40 per cent of the ration for growing-finishing swine, finely ground "pigeon grass" screenings would be expected to have (at least) 90 per cent of the feeding value of good quality feed barley, or feeding value similar to that of average quality oats or fair-to-poor quality feed barley. Note that this value is as finely ground material, not as intact seeds.

Finely ground "pigeon grass" screenings, therefore, constitute a material which may have reasonable potential as a replacement for feed grains in growing-finishing swine rations. Producers should finely grind the screenings to destroy the viability of the weed seeds. The additional costs involved in finely grinding the screenings reduced the dollar value of the unground screenings. Producers are cautioned that screenings should not be ground until immediately before use.