Effect of Grinding on the Digestible and Net Energy Content of Field Peas in Growing Pigs

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SUMMARY

The project aimed at generating reliable information on the digestible and net energy content (DE and NE) in growing pigs fed with field peas ground at 3 different screen-opening sizes (fine, medium and coarse) to obtain different average particle sizes: 156, 650 and 1035 µm, respectively. The digestibility values and DE and NE content increased as the pea particle size decreased from 1035 to 156 µm. Differences were also observed among pea cultivars. It is concluded that the energy content of peas is influenced by its particle size.

"Digestible and net energy content increased as the pea particle size decreased from 1035 to 156 µm"

INTRODUCTION

Previous research at Prairie Swine Centre has shown that field peas vary in energy content by at least 22%, compared to about 15% for wheat and barley. This problem of variability is compounded by our inability to predict the DE content of field peas from chemical or physical composition.

One possibility to improve the nutritional value and, at the same time, reduce variability is the processing of field peas. Grinding improves digestibility by offering a greater surface of contact between the digestive enzymes and the substrate. However, a too fine grinding is expensive and negatively affects the pig since it causes gastric ulcers. The optimal grinding for the use of field peas in swine nutrition is unknown.

The present project aimed at studying the effects of grinding on the digestible and net energy (DE and NE) content of field peas in growing pigs.

MATERIAL AND METHODS

A total of 204 growing pigs (28 kg on average) were used. Thirty-four experimental diets were prepared: a control diet (composed of wheat, barley, soybean meal and a mineral/vitamin premix) and 33 diets composed of 70% control diet and 30% field peas. The diets were supplemented with Celite®, used as a source of acid-insoluble ash, an indigestible marker. Each diet was tested on 6 growing pigs (limit feed). After an adaptation period of 10 d, faecal samples were collected by the grab sampling method for 3 d. The samples were then pooled per animal, freeze-dried and analysed at the University of Saskatchewan. The digestibility and DE/NE content of the diets were calculated. The digestibility and DE/NE content of the peas alone were then also calculated.

RESULTS

The results of digestibility and energy content are detailed in Table 1. Differences in digestibility, DE or NE content were observed among the field peas ($P<0.05$). The Pekoe pea cultivar presented the lowest values and Mozart the highest. The digestibility and energy content increased linearly as the screen opening size decreased from 1035 to 156 µm ($P<0.001$). The average DE content was 3.84, 3.52 and 3.34 Mcal/kg and the NE content 2.69, 2.47 and 2.34 Mcal/kg for fine, medium and coarse grinding peas, respectively ($P<0.001$).

CONCLUSIONS

The digestibility values and energy content of peas improved as the particle size decreased from 1035 to 156 µm in growing pigs. However, in order to determine the optimal particle size of peas for growing pigs, it will be necessary to establish a compromise between energy costs and nutritional value. In the present case, energy cost was not evaluated.

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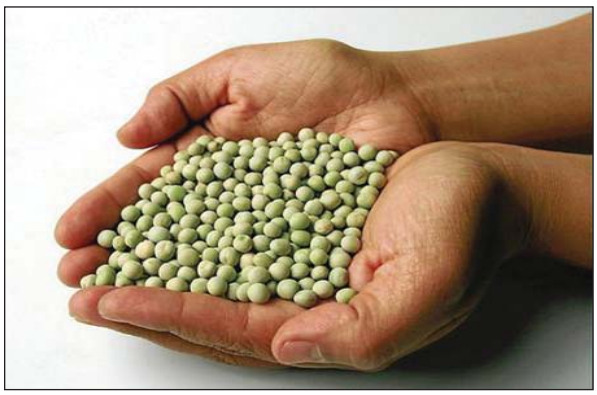

Table 1. Digestibility values and energy contents of the different peas ground to obtain different particle sizes in growing pigs.

		Digestibility (%)				Mcal/kg	
		DM	OM[1]	CP[1]	Energy	DE	NE
Pea							
Acer		81.8 [ab]	81.8 [ab]	73.8 [abc]	78.7 [ab]	3.51 [ab]	2.45 [ab]
Bronco		83.9 [ab]	83.7 [ab]	65.7 [bc]	79.1 [ab]	3.51 [ab]	2.46 [ab]
Camry		83.8 [ab]	83.7 [ab]	65.4 [bc]	79.2 [ab]	3.50 [ab]	2.45 [ab]
Golden		83.5 [ab]	83.2 [ab]	72.8 [abc]	79.4 [ab]	3.59 [ab]	2.51 [ab]
Midas		82.4 [ab]	81.9 [ab]	66.1 [bc]	78.0 [ab]	3.48 [ab]	2.43 [ab]
Mozart		88.8 [a]	88.5 [a]	82.3 [bc]	86.3 [a]	3.84 [a]	2.69 [a]
Nitouche		84.3 [ab]	83.5 [ab]	72.4 [abc]	81.0 [ab]	3.66 [ab]	2.56 [ab]
Pekoe		75.8 [b]	75.1 [b]	61.0 [c]	71.9 [b]	3.20 [b]	2.24 [b]
Salute		85.8 [ab]	84.8 [ab]	78.8 [ab]	83.8 [ab]	3.72 [ab]	2.60 [ab]
Scuba		81.6 [ab]	80.4 [ab]	76.1 [ab]	78.7 [ab]	3.54 [ab]	2.47 [ab]
Soldem		87.2 [a]	86.9 [a]	79.9 [ab]	84.2 [ab]	3.72 [ab]	2.60 [ab]
Screen[2]							
Fine		88.6 [a]	87.7 [a]	79.0 [a]	86.4 [a]	3.84 [a]	2.69 [a]
Medium		82.8 [b]	82.4 [b]	71.5 [b]	79.0 [b]	3.52 [b]	2.47 [b]
Coarse		79.2 [c]	79.0 [c]	66.1 [c]	74.7 [c]	3.34 [c]	2.34 [c]
Pea Screen[2]							
Acer	Fine	85.8	86.0	76.8	83.6	3.73	2.60
	Medium	80.1	79.7	72.5	76.2	3.40	2.37
	Coarse	79.4	797	72.1	76.2	3.40	2.37
Bronco	Fine	89.6	89.4	74.9	85.9	3.81	2.67
	Medium	83.5	83.7	62.7	78.3	3.47	2.43
	Coarse	78.7	78.0	59.5	73.1	3.24	2.27
Camry	Fine	85.5	84.9	64.8	82.1	3.63	2.55
	Medium	85.0	85.3	66.2	79.6	3.52	2.47
	Coarse	80.8	80.9	65.2	75.8	3.35	2.35
Golden	Fine	92.1	91.8	82.2	89.3	3.95	2.77
	Medium	86.2	85.6	74.7	81.9	3.62	2.54
	Coarse	72.1	72.2	61.5	67.0	3.20	2.24
Midas	Fine	86.5	85.1	71.4	83.3	3.71	2.60
	Medium	81.3	81.2	64.6	76.4	3.40	2.38
	Coarse	79.5	79.5	62.3	74.4	3.31	2.31
Mozart	Fine	92.5	91.3	85.9	91.7	4.07	2.85
	Medium	89.6	89.3	82.3	86.3	3.83	2.67
	Coarse	84.2	84.7	78.6	81.0	3.60	2.52
Nitouche	Fine	89.5	88.4	78.1	86.8	3.85	2.70
	Medium	81.4	81.3	73.7	78.1	3.65	2.56
	Coarse	81.9	80.8	65.4	78.1	3.46	2.43
Pekoe	Fine	83.2	81.9	72.5	80.8	3.60	2.52
	Medium	67.5	66.3	50.4	62.8	2.79	1.95
	Coarse	76.7	77.1	60.1	72.0	3.20	2.24
Salute	Fine	91.7	90.4	86.7	90.1	4.00	2.80
	Medium	84.1	82.9	79.2	82.7	3.67	2.56
	Coarse	81.7	81.1	70.4	78.5	3.48	2.43
Scuba	Fine	87.0	85.4	84.5	86.2	3.88	2.71
	Medium	80.5	79.3	78.6	77.6	3.49	2.44
	Coarse	77.2	76.6	65.4	72.3	3.26	2.27
Soldem	Fine	91.1	90.6	91.7	90.2	3.98	2.78
	Medium	91.5	91.8	81.3	88.7	3.91	2.74
	Coarse	78.8	78.3	66.6	73.6	3.25	2.27
Standard Error		2.8	2.8	3.7	3.4	147	103
Statistical Analysis							

[1] Organic matter (OM), Crude protein (CP)

[2] Grinding screen-size: Coarse, 13/64 (5.4 mm opening); Medium, 8/64 (3.28 mm \ opening); and Fine, 1/64 (0.74 mm opening).