STRAW INTAKE AFFECTS CARCASS QUALITY AND PORK QUALITY

M. Trezona*[1], B.P. Mullan[1], J.R. Pluske[2], D.W. Pethick[2] and D.N. D'Souza[3]

[1] Department of Agriculture and Food, Locked Bag No. 4 Bentley DC, 6983 Western Australia, [2] Division of Veterinary and Biomedical Sciences, Murdoch University, Murdoch 6150 Western Australia, [3] Alltech Biotechnology, 68 Nissan Drive Dandenong South, 3175 Victoria Australia. Email: mtrezona@agric.wa.gov.au

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Introduction

In Australia, the majority of pigs are raised in either conventional (indoor) or low cost, deep-litter housing systems. Different types of pig housing systems have different effects on pig carcass quality and objective pork quality (Lambooij, 2004). It has been reported that pigs raised in deep-litter systems and conventional systems that have been enriched with straw have higher growth rates, live weights, carcass weights and backfat thickness compared to pigs of the same age raised in barren conventional housing systems (Beattie *et al.*, 2000; Gentry *et al.*, 2002). Comparisons of objective pork quality between pigs raised in conventional systems and deep-litter or straw-enriched systems have indicated there can be differences in colour, drip loss and shear force (Beattie *et al.* 2000, Maw *et al.* 2001, Lambooij *et al.*, 2004).

van Barneveld *et al.*, (2003) demonstrated that when growing pigs are housed (bedded) on rice hulls, up to 10% of the dietary intake is bedding. These authors suggested that pigs grown on other types of bedding, such as cereal straw, could have similar levels of intake. The consumption of bedding material is likely to alter the digestible amino acid: digestible energy ratio of the diet, and alter the pigs amino acid requirements, changes which may not be accounted for in the formulated diet. This in turn could cause variation in growth performance and carcass quality (van Barneveld *et al.*, 2003).

The aim of this experiment was to determine whether the differences in carcass and pork quality found between pigs housed conventionally and on deep-litter could be replicated by including straw in the diet of growing pigs.

Materials and Methods

This experiment was a 2x2 factorial design. There were 2 dietary treatments: control diets (CD) which were commercial cereal-based grower finisher rations; and the control diets + 10% wheat straw (SD). The diets were pelleted to ensure the incorporation of the added straw. The calculated analyses for the grower and finisher diets were: CD grower: digestible energy (DE)=13.5 MJ/kg, available lysine (LYS)=9.3 g/MJ DE, 68 g/kg crude fibre (CFIB), 22.6 g/kg acid detergent fibre (ADF) and 183.0 g/kg neutral detergent fibre (NDF); SD grower: DE=13.3 MJ/kg, LYS=9.3 g/MJ DE, 103.0 g/kg CFIB, 53.1 g/kg ADF, 183.0 g/kg NDF; CD finisher: DE=13.0 MJ/kg, LYS=6.9 g/MJ, 68.9 g/kg CFIB, 200.0 g/kg NDF; SD finisher: DE=12.8 MJ/kg, LYS=6.9 g/MJ DE, 105.0 g/kg CFIB, 32.5 g/kg ADF, 200.0 g/kg NDF. There were 2 flooring treatments in the otherwise identical conventional grower-finisher pens. The first flooring treatment was partially slatted concrete flooring (CF), common to conventional pig production systems, and the second flooring treatment was straw bedding (SF) to mimic deep-litter production systems. The pens were bedded thickly with straw to completely cover the concrete floor, and were cleaned out twice a week after which approximately 14kg of fresh straw/pen was added. Pigs had *ad libitum* access to feed and fresh cool water.

Ninety-six Large White x Landrace female pigs were stratified by weight at 8 weeks of age, into groups of 6. Each group was then randomly allocated across pens and treatments. There were 4 pens, and therefore 24 pigs, per treatment. Individual live weight and feed supplied per pen were recorded weekly. Pigs were slaughtered at a commercial abattoir at 24 weeks of age (~120 kg LW). Twenty-four hours post slaughter a sample of the *longissimus dorsi* from the carcasses of 3 pigs per pen were collected. A 20mm steak was cut from the sample and pHu, colour and drip loss were measured on the freshly exposed surface. Drip loss was measured using the filter paper method and surface lightness (L*), redness (a*) and yellowness (b*) were measured using a Minolta Chromameter CR-400. A 100g block of *l. dorsi* was used to determine cook loss and measure shear force (Warner Bratzler shear blade fitted to an Instron Universal Testing Machine). A further 20g block of *l. dorsi* was used to determine the percentage of intramuscular fat (%IMF) via ether extraction. Data were analysed by using Genstat 8th Edition 2005 (Lawes Agricultural Trust) to conduct two-way analyses of variance.

Results and Discussion

Significant main effects on live weight were found for diet and floor type. Pigs fed the 10% straw diet and/or housed on straw had the highest live weights compared to pigs that had no access to straw ($P<0.05$). There was a similar trend for carcass weight where pigs with access to straw either in the diet or as bedding had heavier carcass weights ($P<0.100$) than pigs without straw. For both measures there was no interaction between diet and floor ($P>0.05$). There was no effect of treatment dressing percentage or P2 backfat depth ($P>0.05$) (Table 1).

Table 1: The effect of diet and floor type on carcass quality and objective pork quality of the *longissimus dorsi* in 24 week old female pigs.

	Treatment				SED	P-value		
	SD -CF	SD-SF	CD-CF	CD-SF	Diet*Floor	Diet	Floor	Diet*Floor
Live weight (kg)	115.1^{bc}	119.0^{c}	110.4^{a}	114.1^{ab}	2.26	0.005	0.023	0.963
Carcass weight (kg)	78.53^{ab}	81.53^{b}	76.41^{a}	78.53^{ab}	2.05	0.085	0.084	0.762
Dressing %	68.17	68.52	69.17	68.78	0.827	0.288	0.970	0.529
P2 (mm)^	13.7	14.8	14.0	14.6	0.996	0.906	0.243	0.724
Shear Force (kg)	6.12	5.23	6.03	5.87	0.607	0.521	0.230	0.396
Colour L*	53.24	53.04	51.53	53.15	1.515	0.457	0.508	0.399
a*	6.07	6.51	5.79	5.61	0.506	0.107	0.719	0.393
b*	4.21	4.66	3.99	4.15	0.401	0.182	0.257	0.660
pH	5.72	5.67	5.73	5.71	0.050	0.445	0.321	0.745
Drip loss (%)	2.03^{a}	2.59^{b}	2.08^{a}	1.88^{a}	0.191	0.017	0.200	0.007
Cook Loss (%)	33.96^{b}	33.3^{ab}	33.78^{ab}	32.73^{a}	0.585	0.369	0.045	0.634
%IMF	1.14	1.62	1.54	1.43	0.262	0.577	0.330	0.131

^{a,b,c} different superscripts within rows indicate significant difference, LSD 5%.

There was a main effect of diet (P=0.017) and an interaction between diet and floor (P=0.007) on percent drip loss. Pigs with access to straw either via the straw diet or straw bedding had a significantly higher percent drip loss compared to pigs that had no access to straw. Johnston *et al.* (2005) found drip loss was higher in pork from pigs housed in deep-litter systems compared to pigs in conventional systems, however other researchers have found percent drip loss and percent cook loss to be higher in pigs housed in a barren conventional environment (Gentry *et al.* 2002, Lambooij *et al.*, 2004). The results for percent cook loss concur with the findings of Gentry *et al.*(2002) and Lambooij *et al.*, (2004) where pork from pigs housed on concrete had a higher percent cook loss compared to pork from pigs housed on straw (P=0.045). The difference in %IMF of the *l. dorsi* between treatments was not significant (P>0.05). However, the difference in average %IMF between pigs fed the straw diet and housed on concrete (1.14%) compared to pigs fed the straw diet and housed on straw (1.62%) may have positively affected eating quality. Fernandez *et al.*, (1999) reported that taste panellists comparing pork from different categories of %IMF identified the texture of pork with 1.5-2.5% IMF as being more favourable than pork with <1.5% IMF.

Conclusions

The results from this experiment indicate that the ingestion of straw affects growth performance, carcass quality and pork quality and may contribute to the differences that are found between pigs housed conventionally (indoors) and on deep-litter. Similarities in the results between pigs that were fed the straw diet and pigs fed the control diet and housed on straw confirm that pigs consumed bedding in sufficient quantities to affect growth, carcass and meat quality parameters.

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