



The effects of dietary fructo-oligosaccharide addition on boar taint compounds and performance in heavy slaughter weight boars and gilts



L. Salmon*, S.A. Edwards¹

School of Agriculture, Food and Rural Development, Agriculture Building, University of Newcastle, Newcastle upon Tyne, NE1 7RU, UK

ARTICLE INFO

Article history:

Received 21 April 2012

Received in revised form 20 May 2015

Accepted 21 May 2015

Keywords:

Non starch polysaccharide

Pig

Skatole

Taint

Boars

Performance

ABSTRACT

Increasing slaughter weight in finishing pigs may increase the risk of carcass taint from compounds such as skatole. An experiment was carried out to determine the effects of dietary inclusion of short chain fructo-oligosaccharide (scFOS), on performance, the levels of skatole in digesta, faeces and backfat in heavy slaughter weight boars and gilts. Pigs ($n = 112$), with an initial bodyweight of 57 ± 1.15 kg. (mean \pm SD), were allocated in a randomised complete block arrangement in four replicates over two time blocks. Pigs were allocated to one of two dietary treatments, Negative Control (NC) and Negative Control plus 2 g/kg scFOS and separated by gender, boar and gilt to create a 2×2 factorial design. Pigs were housed in single sex pens of 6–8 pigs in controlled-environment, partially-slatted pens. The Basal NC diet was a commercial pelleted finisher diet (170.8 g/kg CP, 13.37 MJ/kg DE, 10.3 g/kg Lysine) fed ad-libitum. The scFOS preparation contained kestose, nystose and fructosyl nystose.

Pen feed intake was calculated weekly with pigs being weighed and backfat measurements taken every two-weeks to calculate daily live weight gain with back fat at the P2 position measured ultrasonically. Faecal samples were taken at each weighing, and colon content and backfat samples were taken at slaughter. Data were evaluated using analysis of variance. Boars were more efficient than gilts at this heavier weight range, but back fat thickness showed no difference between genders. Faecal indole concentration increased with age, but faecal skatole did not reflect this increase. A 2 g/kg dietary inclusion of scFOS had no effect on performance and no consistent significant effect on skatole or indole concentrations in faeces or in the colon digesta at slaughter. However, scFOS did reduce ($P < 0.009$) the carcass fat concentration of skatole thus reducing risk of carcass taint. This effect was more pronounced in the boars due to their higher fat skatole concentration. These results suggest a 2 g/kg dietary inclusion of scFOS in finisher diets would be beneficial in reducing carcass taint but not in the reduction of malodorous faecal compounds.

© 2015 Elsevier B.V. All rights reserved.

Abbreviations: B, boar; CP, crude protein; DE, digestible energy; DFI, daily feed intake; DLWG, daily live weight gain; DLTG, daily lean tissue growth; FCR, feed conversion ratio; FOS, fructo-oligosaccharides; G, gilt; LWT, liveweight; NC, negative control; NSP, non-starch polysaccharides; MJ/kg DE, mega joule per kilogram; MLC, Meat and Livestock Commission; scFOS, short chain fructo-oligosaccharide; SBP, sugar beet pulp.

* Corresponding author. Current address: Premier Nutrition, Brereton Business Park, The Levels, Rugeley, Staffordshire WS15 RD, UK. Tel.: +44 0 1889 572500; fax: +44 0 1889 577074.

E-mail addresses: lorraine.salmon@premiernutrition.co.uk (L. Salmon), sandra.edwards@ncl.ac.uk (S.A. Edwards).

¹ Tel.: +44 0 191 222 8350; fax: +44 0 191 222 7811.

1. Introduction

As dietary nutrient density requirement decreases with increasing age, the diet may oversupply the energy and protein needed for lean tissue growth in the later stages of fattening, resulting in reduced feed efficiency and poorer carcass grading. There is also increased risk of the microbial degradation of excess amino acids such as tryptophan to skatole and other indolic compounds which give undesirable odours and flavours (taint) in the carcass (Laue et al., 1997). The risk of such compounds is increased when pigs are taken to heavier weights. Part of this risk is derived from the development of androstrenone production in entire males, but a significant part is related to dietary factors (Raab et al., 1997). The use of non-starch polysaccharides (NSP) has been suggested to give a reduction in the production and absorption of skatole, although previous trials using NSP have produced conflicting results (Van Oeckel et al., 1998; Wiseman et al., 1999; Knarreborg et al., 2002). The use of fructo-oligosaccharides (FOS), has been shown to influence the microbial population and reduce skatole production *in vitro* (Xu et al., 2002), but this has yet to be proven consistently *in vivo*. Short chain FOS (scFOS) are compounds built up of fructose molecules with a glucose molecule. Short chain FOS are found in many fruit and vegetables, being most abundant in artichoke, chicory and members of the onion family (Campbell et al., 1997). They are resistant to acidic and enzymatic hydrolysis in the gastrointestinal tract (Cromwell, 2001), and thus act as a substrate for beneficial microflora in the proximal part of the colon.

The principal microflora affected favourably appear to be Bifidobacteria and some Lactobacilli. The growth of the Bifidobacteria is usually accompanied by a decrease in pH in the large intestine (Bornet et al., 2002). This decrease in pH is thought to change the gut environment and the microbial biota and shift the microbial metabolism of tryptophan away from skatole production and towards indole production (Xu et al., 2002; Li et al., 2009). The hypothesis of this study is that the inclusion of scFOS reduces the production of skatole and its storage in back fat in heavy weight slaughter boars and gilts, and hence the risk of boar taint in the meat products.

2. Materials and methods

2.1. Pigs, experimental design and diets

A randomised complete block arrangement in four replicates over two time blocks was used to study the effect of scFOS and gender on skatole production and carcass taint in heavy finishing weight pigs. Pigs were allocated to one of two dietary treatments, Negative Control (NC) and Negative Control plus 2 g/kg scFOS (scFOS) and separated by gender, entire boar (B) and gilt (G) to create a 2 × 2 factorial design. The experiment was carried out at the University of Newcastle's pig research unit. A total of 112 Large White–Landrace cross pigs were taken from the University of Newcastle's commercial finishing herd, selecting equal numbers of boars and gilts at an average liveweight of 57 kg ± 9.53 (mean ± standard deviation). Pigs were housed in single sex pens within single sex rooms. For replicates 1 and 2, eight pigs were reared per pen. In replicates 3 and 4, the number was reduced to six pigs per pen. The building was filled twice over time, giving a total of 4 pen replicates for each of the treatment combinations. Pens had partially slatted concrete floors with 22% slatted area. Room temperature was controlled initially at 19 °C, and gradually reduced weekly to 14 °C, by thermostatically controlled fan ventilation. Lighting was controlled automatically with 12 h light, 12 h dark. Pen size was 9.6 m², providing a space allowance of 1.2 m²/pig for the first two replicates, and 1.6 m² for the subsequent two.

Pigs were fed using one single diet per treatment from 60 kg to 130 kg. The diets were fed *ad libitum* as a dry pellet. Diets were manufactured by a commercial manufacturer (Top Grade Finisher pellets, FeedCo, Cocklane, Piercebridge, County Durham, DL2 3TJ), with identical basal formulation (Table 1) (170.8 g/kg crude protein, 10.3 g/kg lysine, 13.37 MJ digestible energy/kg) for both NC and NC+scFOS containing diet.

The scFOS was sourced from SCA Nutec Ltd., Eastern Avenue, Watery Lane, Lichfield, UK. The addition of 2 kg/t of scFOS, replacing 2 kg of the wheat in the basal NC diet was based on commercial recommendations from previous research. The scFOS product contained kestose, nystose and fructosyl nystose at a ratio of 370 g/kg:530 g/kg:100 g/kg.

For replicates one and two, a feeder space allowance of 15 cm/pig was provided. For replicates three and four a feeder space allowance of 10 cm/pig. Trough space was reduced to reduce the apparent feed wastage visible in replicates one and two. Feed hoppers were topped up as required to maintain *ad libitum* access. Feed inputs were recorded and feed refusals weighed weekly, and additionally when any pigs were removed, to calculate mean daily feed intake per pig.

2.2. Experimental procedures and sampling

Pigs were allocated to balance pens for age and weight, with a start weight of approx 57 kg. Pigs within each block were selected from a group born in the same week, and animals were individually ear tagged once allocated. Slaughter date was dependent on live weight, rather than a fixed age. Pigs were slaughtered in two stages per pen, with the first when the average live weight of 50% of the pigs reached 130 kg. If there was a large variation of live weight within a pen, the pigs were slaughtered before reaching a maximum of 135 kg.

Pigs were individually weighed and ultrasonic back fat measurements taken at the P2 site using a Meritronics Livestock Grader (Meritronics Ltd., Faversham, Kent, ME13 0BT), at allocation, and then fortnightly until slaughter. At each weighing,

Download English Version:

<https://daneshyari.com/en/article/2419444>

Download Persian Version:

<https://daneshyari.com/article/2419444>

[Daneshyari.com](https://daneshyari.com)