The Professional Animal Scientist 30 (2014):252–259

Growth performance, carcass characteristics, and pork quality of pigs fed plum juice concentrate as a feed additive

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ABSTRACT

Yorkshire pigs (n = 32) were used to determine the influence of supplementation of plum juice concentrate (PJC) on growth and carcass and quality characteristics of pork. Pigs were sorted by weight and sex (n = 16 barrows, n = 16 gilts) and assigned to 16 pens with 2 pigs per pen. Pens were randomly allotted to 4 diets: 0 (control), 0.5, 1.0, or 3.0% PJC. During the feed trial, feed intake and weight gain were monitored every 14 d. Pigs were slaughtered at an average pen weight of 114 kg (group 1 = 84 d; group 2 = 98 d). Supplementation of PJC did not affect (P > 0.05) animal performance. Supplementation of PJC did not affect (P > 0.05) carcass characteristics. However, gilts had a larger loin muscle area (P = 0.02) and less fat at the 10th rib (P = 0.01) than barrows. Supplementing PJC had little effect on pork quality. However, pork from barrows produced less drip loss (P = 0.02) in comparison with gilts. In conclusion, supplementation of PJC up to 3.0% in the diet did not affect growing-finishing pig performance, carcass characteristics, or pork quality.

Key words: plum juice concentrate, growth performance, carcass characteristics, pork quality

INTRODUCTION

Consumers scrutinize food more today than they did in the past, and their preference is beginning to change to a more "natural" label (McCarthy et al., 2001; Rhee et al., 2001; Troy and Kerry, 2010). Although consumers pay more attention to credence qualities such as safety, healthiness, convenience, locality, and ethical factors (Issanchou, 1996; Bernués et al., 2003), they still take into consideration meat-quality attributes such as meat color, visible drip, and visible fat (Troy and Kerry, 2010). The pork industry struggles with 2 main quality concerns: inadequate color and poor water-holding capacity (Cannon et al., 1995). In addition, lipid oxidation is another concern due to its association with color, water-holding capacity, flavor, texture, nutritive value, and safety (Buckley et al., 1995). With the demand for a natural label, feed additives preslaughter may be one solution to increasing meat quality. Limited research has been done in this area.

The meat industry typically uses synthetic antioxidants such as butylated hydroxyanisole and butylated hydroxytoluene to inhibit oxidation and improve meat quality (Sato and Hegarty, 1971; Chastain et al., 1982; Chen et al., 1984). But with consumers becoming more concerned with their potential toxicological effects (Decker and Mei, 1996; Rababah et al., 2004), alternative approaches need to be studied. Recent research has identified plums as a functional ingredient to inhibit lipid oxidation and improve meat quality (Nuñez de Gonzalez et al., 2008a,b; Yildiz-Turp and Serdaroglu, 2010). Plums have a high phenolic content (Nakatani et al., 2000; Gil et al., 2002; Kim et al., 2003), and some phenolics are effective natural antioxidants (Di Carlo et al., 1999). In addition, pectin in plums increases moisture retention, malic acid enhances flavor, and sorbitol acts as a natural humectant (Nuñez de Gonzalez et al., 2009). Yet no current studies have been done to determine the effect of plum or plum-derived products on meat quality through feed supplementation, and most current studies have focused

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Table 1. Nutrient composition of the plum juice concentrate (PJC)[1]

Item, g	Amount per 100 g
Water	30.50
Protein	2.34
Glucose	30.60
Fructose	14.50
Sucrose	0.68
Sorbitol	17.80

[1]Provided by Sunsweet Growers Inc., Yuba City, CA

on addition of plum products into postslaughter processed beef. Therefore, the objective of this study was to determine the effect of supplementing grower-finisher diets with plum juice concentrate (**PJC**) on the growth performance, carcass characteristics, and overall meat quality of pigs.

MATERIALS AND METHODS

Animals and Diets

Purebred Yorkshire pigs (n = 32) were acquired at a BW of 22.7 ± 4.54 kg. They were raised during the growing and finishing phases in an open barn with half concrete and half slatted floors at the Auburn University Swine Research and Education Center (IACUC PRN: 2011–1890). Pigs were sorted by weight and sex (n = 16 barrows, n = 16 gilts) and then randomly assigned to 16 pens with 2 pigs per pen. Pigs assigned to the same pen had the same sex and similar BW. Pens were randomly allotted to 1 of the 4 dietary treatments: 0 (control), 0.5, 1.0, or 3.0% PJC (Sunsweet Growers Inc., Yuba City, CA). Composition of PJC is found in Table 1. Diets were formulated to be isocaloric, by replacement of the protein, water, and sugar content of PJC with the equivalents in each diet (Table 2). Basal diets consisted of corn and soybean meal (Tables 3 and 4) formulated to meet or exceed National Research Council (NRC, 1998) recommendations. During the mixing of each dietary treatment, PJC was incorporated directly into the batch. Pigs were allowed ad libitum access to feed and water. Pigs were transitioned from the grower diet to a finishing diet at an average pen weight of 68 kg. During the feed trial (group 1 = 84 d; group 2 = 98 d), feed intake and weight gain were measured every 14 d. At an average pen weight of 114 kg, pigs were transported to the Auburn University Lambert-Powell Meats Laboratory.

Carcass Data Collection

Pigs were humanely slaughtered at the Auburn University Lambert-Powell Meats Laboratory under USDA-Food Safety and Inspection Service inspection. Because of the capacity of the slaughter facility, the pigs were slaughtered in 2 groups. The first group consisted of the 16 animals that were closet to the target 114 kg. Carcasses were chilled for 24 h at 1 to 3°C. The pH of right loin and ham was monitored 30 min, 45 min, 3 h, 6 h, and 24 h after the animal was slaughtered by using a portable pH spear probe meter (Oakton Instruments, Vernon Hills, IL). Both live weight and HCW were recorded to determine DP [DP = (HCW/final BW) × 100]. Following the 24-h chill period, carcasses were ribbed between the 10th and 11th rib. Tenth-rib and last-rib backfat and loin muscle area (**LMA**) were measured.

Subjective evaluation of marbling, wetness, firmness, and muscling score was conducted by trained personnel using published visual standards (NPPC, 2000). In addition, the longissimus muscle at the 10th rib was used for objective color analysis. Hunter L* (lightness), a* (redness), and b* (yellowness) values were measured by a Hunter Miniscan XE Plus (Hunter Lab, Reston, VA), using a D65 light source, a 10° viewing angle, and a 35-mm viewing area. The Miniscan was calibrated according to the manufacturer's recommendations. Following carcass evaluation, a section of the longissimus muscle was removed

Table 2. Plum juice concentrate (PJC) supplementation composition

	Diet			
Item, kg	0% PJC	0.5% PJC	1.0% PJC	3.0% PJC
Glucose	1.60	1.34	1.08	—
Fructose	0.80	0.66	0.54	—
Sucrose	0.50	0.42	0.34	—
Sorbitol	0.97	0.82	0.64	—
Corn	0.90	0.76	0.60	—
Water	2.01	1.68	1.34	—
PJC	—	1.14	2.28	6.82
Total	6.82	6.82	6.82	6.82

Table 3. Composition of soybean meal and corn (% as fed)[1]

Item	Soybean meat	Corn
DM	87.66	86.14
CP	48.06	8.20
Arg	3.27	0.41
His	1.17	0.25
Ile	2.09	0.30
Leu	3.42	1.04
Lys	2.82	0.27
Met	0.62	0.19
Cys	0.65	0.20
Met + Cys	1.27	0.39
Phe	2.33	0.39
Thr	1.80	0.31
Trp	0.62	0.07
Val	2.17	0.05

[1]Samples were analyzed by a commercial laboratory.