Table 265. Colorimetric and pH measurements of breast meat of broilers at 21 d of age fed byproduct of guava (decanter) in the diet

Treatment	L*	a*	b*	pH
0% guava byproduct	40.65	4.38	6.36	5.96
0.5% guava byproduct	39.65	4.05	5.36	6.08
1.0% guava byproduct	40.53	4.81	6.68	5.95
1.5% guava byproduct	40.89	4.32	6.49	5.96
P-value	0.6762	0.7326	0.2391	0.5813
CV, %	3.96	25.99	15.91	2.59

3 different points in the ventral portion of the breast and thigh muscles using a calorimeter. For analysis of pH, readings were made in triplicate in ventral muscle using the pH meter. Data were submitted to ANOVA. The computer statistical program R was used. No significant ($P > 0.05$) difference was observed between the colorimetric and pH measurements of breast meat and thigh of broilers in the initial phase fed different levels byproduct of guava in the diet (Table 265). We conclude that use of the byproduct of guava as a nutritional additive in broiler diet did not influence meat quality of broilers.

Key Words: additives, broiler, guava

266 **Effects of dietary level and withdrawal period of distillers dried grains with solubles on pork belly fat iodine value.** J. E. Estrada[1,*], M. Ellis[1], S. J. Hardman[1], A. M. Gaines[2], B. A. Peterson[2], O. F. Mendoza[2], [1]*University of Illinois, Champaign-Urbana,* [2]*The Maschhoffs, LLC, Carlyle, IL.*

There is concern over the potential negative effects of feeding corn distillers dried grains with solubles (DDGS) to growing–finishing pigs on fat composition and quality, particularly of the belly. The objective of this study was to evaluate the effect of increasing dietary level of DDGS (8.8% crude fat) and of DDGS withdrawal period prior to harvest on belly fat iodine value (IV). A randomized complete block design was used with a 3 × 4 factorial arrangement of treatments: 1) DDGS inclusion levels 20, 40, and 60% and 2) DDGS withdrawal period 0, 3, 6, and 9 wk prior harvest. A control (0% DDGS fed throughout the study) was included as a contrast treatment. The study was carried out in a commercial facility using a total of 3,536 pigs housed in mixed-sex groups of 34 (8 pens/treatment); start and end BW were 23.4 ± 4.43 and 129.5 ± 12.04 kg, respectively. At the end of the growth period, pigs were harvested at a commercial facility and a fat sample was taken from the anterior end of the belly from a randomly selected sample of half of the pigs in the pen (equal numbers barrows and gilts). Iodine value was measured using near-infrared spectroscopy. Increasing dietary DDGS inclusion level linearly increased ($P < 0.001$) belly fat IV (67.5, 71.2, 74.6, and 77.3 g/100 g for 0, 20, 40, and 60% DDGS, respectively; SEM 0.43). Withdrawing DDGS from the diet prior to harvest linearly reduced ($P < 0.001$) belly fat IV (77.9, 75.4, 73.1, and 70.6 g/100 g for withdrawal periods of 0, 3, 6, and 9 wk, respectively; SEM 0.33). Regression of belly fat IV on timing of DDGS withdrawal showed that the rate of decrease was greater ($P < 0.001$) for pigs previously fed the higher levels of DDGS (slopes of linear regression –0.45, –0.82, and –1.17 g/100g for the 20, 40, and 60% DDGS inclusion levels, respectively). The results of this study suggest that the increase in belly fat IV from feeding DDGS can be mitigated by feeding diets without DDGS prior to harvest and that the extent of change in IV during the withdrawal period is influenced by the level of DDGS fed previously.

Key Words: distillers dried grains with solubles, iodine value, pigs, withdrawal

267 **Effectiveness of flavor enhancers in reduced sodium natural deli-style turkey breast.** C. G. Bower*, B. Cleveland, D. E. Burson, G. Sullivan, *University of Nebraska, Lincoln.*

The objective of this study was to determine the quality, textural, and sensory effects of natural flavor enhancers on reduced-sodium natural deli-style turkey breast when compared to a full-sodium, traditionally produced product. Chunked and formed turkey breast rolls (25% extended) were manufactured using 4 treatment formulations: 1) reduced-sodium natural deli-style turkey breast (NTB) containing 1.5% salt, 1% sugar, and 0.5% dehydrated high-protein turkey stock; 2) NTB plus 0.1% dehydrated yeast extract (NTB+YE); 3) NTB plus 0.1% dehydrated turkey broth (NTB+TB); and 4) full sodium control containing 2% salt, 1% sugar, and 0.5% sodium phosphate. Turkey rolls were cooked to an internal temperature of 71°C, stabilized overnight at 1°C, and sliced. Samples were evaluated for texture profile analysis (TPA), consumer sensory evaluation, cook yield, slice yield, slice foldability, slice peelability, salt, pH, and objective color (L*, a*, and b*). For TPA, the control had higher scores for gumminess, cohesiveness, springiness, and chewiness compared to all treatments ($P < 0.0001$), whereas there was no difference among the reduced-sodium treatments. All treatments had similar hardness. During sensory evaluation, the NTB treatments were found to be softer than the control ($P < 0.0001$). The control was juicier ($P < 0.0001$) and had the greatest turkey flavor ($P = 0.0035$), salt flavor ($P < 0.0001$), flavor acceptability ($P < 0.0001$), texture acceptability ($P < 0.0001$), and overall acceptability ($P < 0.0001$). The NTB+YE was found to be juicier than NTB ($P = 0.034$). There was no difference among any of the treatments for chewing texture or off-flavor. The control had a greater cook yield than all treatments ($P < 0.0001$). The control also had lower L* values than all treatments ($P = 0.0131$) whereas there was no difference in a* or b*. The control also had the highest peelability score ($P < 0.0001$) whereas NTB was higher than NTB+YE ($P = 0.0424$). There were no differences among treatments for number of slice yield or foldability. The control had greater salt concentration ($P < 0.0001$) and higher pH ($P = 0.0018$) than all NTB treatments. The control and NTB+YE had similar water activity, whereas NTB and NTB+TB had a higher water activity than the control ($P = 0.004$). Results indicated the quality,

yield, and textural attributes of traditionally prepared deli-style turkey breast is difficult to achieve with reduced sodium and natural ingredients and the use of turkey broth and yeast extract has little effect on these attributes.

Key Words: deli turkey, flavor enhancers, reduced sodium

268 **Effects of varying corn or soybean coproduct inclusion in finishing diets of feedlot heifers on carcass characteristics and fresh meat quality.**
M. A. Nelson*, J. Johnston, A. DiCostanzo, R. B. Cox, *University of Minnesota, Saint Paul.*

The impact of using corn or soybean coproduct in high or low corn grain finishing diets of feedlot heifers was evaluated. Forty-four purebred Limousin heifers were used in a randomized design with 4 treatments: 65% corn grain (CG) diets with either 20% modified distillers grains with solubles (MDGS) or a combination of glycerin and high-fiber, high-protein soybean coproduct (SOY; HI+SOY) or 25% CG diets with 60% MDGS or with 40% MDGS and 20% SOY (LO+MDGS+SOY). All heifers received melengestrol acetate and Rumensin. Experimental unit was individual heifer, as all animals were fed individually using a Calan gate system. Response variables evaluated included carcass characteristics and fresh meat quality characteristics. Heifers were fed finishing diets for 129 d and were humanely harvested at a commercial facility. Hot carcass weight, 12th rib back fat (BF), rib eye area (REA), percent KPH, and marbling score were collected 48 h postmortem by trained plant personnel. Carcasses were fabricated by plant personnel and strip steaks were collected for drip loss, Warner–Bratzler shear force, and retail shelf life evaluation. Six readings per strip steak were recorded for Warner–Bratzler shear force values and 8 replicates were recorded for 7-d retail shelf life on strip steaks. There was no treatment effect for HCW ($P = 0.37$), BF ($P = 0.10$), REA ($P = 0.63$), KPH ($P = 0.67$), or marbling score ($P = 0.18$). Drip loss did not differ among treatments ($P = 0.85$). Treatment affected Warner–Bratzler shear force ($P = 0.03$) of strip steaks. Warner–Bratzler shear force of strip steaks from HI+SOY (3.17 kg) and LO+MDGS+SOY (3.79 kg) were different ($P = 0.02$). Treatment did not affect subjective scores for lean color ($P = 1.00$), surface discoloration ($P = 0.19$), and overall appearance ($P = 0.52$) of strip steaks. Results indicate feeding high levels of corn or soy coproduct in feedlot heifer diets does not have an effect on carcass characteristics, drip loss, or subjective retail shelf life evaluation; however, combining all coproducts in a low grain inclusion diet impacted Warner–Bratzler shear force.

Key Words: beef, fresh meat quality, modified distillers grains

Table 269.

Crystalline AA:	Grain source					
	Sorghum			Corn		
	Low	Medium	High	Low	Medium	High
d 0 to 21						
ADG[1], g	486	473	469	473	479	478
ADFI[1], g	745	722	740	729	729	739
G:F[1]	0.658	0.660	0.638	0.654	0.664	0.651

[1]SEM was 19.8, 33.8, and 0.01 for ADG, ADFI, and G:F, respectively.

NONRUMINANT NUTRITION: PROTEIN AND AMINO ACID NUTRITION

269 **Effects of increasing crystalline amino acids in sorghum- or corn-based diets on nursery pig growth performance.**
K. E. Jordan*, J. Nemechek, M. A. Goncalves, R. D. Goodband, M. D. Tokach, S. S. Dritz, J. M. DeRouchey, J. C. Woodworth, *Kansas State University, Manhattan*

A total of 300 pigs (PIC 1050; initially 10.6 kg BW) were used in a 21-d study to compare the effects of increasing crystalline AA in sorghum- and corn-based diets on nursery pig growth performance. Treatments with 5 pigs per pen and 10 pens per treatment were arranged in a 2 × 3 factorial with main effects of grain source (sorghum vs. corn) and crystalline AA supplementation (low, medium, or high). Because replacing increasing amounts of soybean meal with crystalline AA changes the NE of the diet, all diets were formulated 5.04 g SID Lys:Mcal NE. The Lys concentration in the diets was formulated at 95% of the pig's estimated requirement to ensure that the other AA, on a ratio relative to Lys, would not be underestimated. Amino acid ratios to Lys and standardized ileal digestibility (SID) coefficients used were obtained from NRC (2012). The grain sources and soybean meal were analyzed for AA profile and diets formulated from these concentrations. Sorghum AA concentrations were 0.17% Lys, 0.13% Met, 0.23% Thr, 0.08% Trp, and 0.33% Val. Corn was analyzed to be 0.23% Lys, 0.17% Met, 0.28% Thr, 0.06% Trp, and 0.36% Val. Soybean meal was analyzed to be 2.86% Lys, 0.65% Met, 1.82% Thr, 0.68% Trp, and 2.13% Val. The low AA fortification contained L-lysine HCl and DL-methionine. The medium AA fortification contained L-lysine HCl, DL-methionine, and L-threonine, and the high AA fortification contained L-lysine HCl, DL-methionine, L-threonine, and L-valine. Overall, there were no main or interactive effects ($P > 0.05$) of grain source or AA supplementation rate detected for ADG, ADFI, or G:F. This suggests that balancing to the third, fourth, or fifth limiting AA is possible in both sorghum- and corn-based diets with the use of crystalline AA without detrimental effects on growth performance. Results also suggest that corn and sorghum elicit similar nursery pig performance when serving as