Egg and Meat Science and Muscle Biology - Livestock and Poultry I

M54   Performance and egg quality of four quail genetic groups. C. Móri[1], E. A. Garcia[1], A. C. Pavan[1], C. C. Pizzolante[2], R. M. S. Emediato*[1], S. A. Maestá[1], and D. A. Berto[1], [1]*São Paulo State University, Botucatu, São Paulo, Brazil*, [2]*São Paulo Agency of Agribusiness Tecnology, Brotas, São Paulo, Brazil.*

The study aimed to evaluate the performance and egg quality of four genetic groups selected for meat production. Two hundred and eighty eight quails of 42 days of age were used. The experiment design was the completely randomized blocks with four treatments (genetic groups A, B, C and D) and six replications of 12 birds each. In the first week it was given 14 hour of light with increases of 30 minutes per week until it reaches 17 hours of light. Eggs and feed were weighted once a week to determine egg weight and feed consumption. Three eggs from each replication were collected and analyzed after each 28 days period during 3 consecutive days to evaluate their quality. There were significant differences (p<.05) among the genetic groups for egg weight and egg mass with higher values for the genetic group B. Treatment D has shown higher means for specific gravity and shell percentage. Quails used for meat production have shown as good for egg production with good quality of eggs.

Key Words: Egg Production, Meat Quail, Performance

M55   Relationship between calpastatin activity and lamb carcass characteristics. J. A. Gevin*[1], H. N. Zerby[1], P. S. Kuber[1], S. J. Moeller[1], M. P. Wick[1], D. R. Notter[2], T. D. Leeds[3], and M. R. Mousel[3], [1]*The Ohio State University, Columbus*, [2]*Virgina Polytechnic Institute and State University, Blacksburg*, [3]*USDA-ARS, U.S. Sheep Experiment Station, Dubois, ID.*

The purpose of this study was to determine if calpastatin activity (CALP) was related to the amount of intramuscular fat (IMF) and Warner-Bratzler shear force (WBS) in lamb carcasses. Market wethers representing three sire lines (n = 40, average live weight of 68.9 kg) were harvested at the OSU Meat Science Laboratory. *Longissimus thorasis* (L) samples were taken 24 h postmortem (PM) for determination of CALP and IMF (Caviezel® method). Standard carcass measurements were collected to assess relationships among traits. Nine (2.5 cm) chops were removed from the L at approximately the 7th through the 12th rib location, utilizing both the left and right side of the rack. Chops were randomly assigned to one of three (24 h, 72 h, and 7 d PM) aging periods and WBS was measured. Correlations between CALP, IMF, WBS and carcass traits were calculated. Using a mixed model with fixed sire line, aging and a sire line by aging interaction and a random animal within sire line effect, the force to shear samples decreased (P < 0.01) over time (24 h, 72 h and 7 d), with least squares means of 4.7 kg, 4.2 kg, and 2.7 kg, respectively. Percent intramuscular fat ranged from 2.9% to 8.5% with a mean of 5.8% (std. dev. 1.2%). Calpastatin was significantly (P < 0.03) and positively correlated with 24 h, 72 h, and 7 d WBS, r = 0.35, 0.40, and 0.40, respectively. Simple correlations of CALP with IMF (r = -0.22, P = 0.17), backfat (r = -0.07, P = 0.68) and body wall (r = .0002, P = 0.99) were not significant. Furthermore, IMF was not significantly correlated with 24 h (r = 0.08, P = 0.63), 72 h (r = 0.13, P = 0.41), or 7 d (r = 0.06, P = 0.72) WBS. These results are consistent with previous literature in lamb and beef reporting that CALP is positively correlated with WBS and in beef that IMF is not directly related to WBS. The correlation between CALP and IMF warrants further investigation.

Key Words: Calpastatin, Lamb, Intramuscular Fat

M56   Effect of salt, trisodium phosphate, BHA/BHT and CLA on sensory, quality and instrumental color characteristics of beef strip loins of different quality grades. C. W. Rowe*, F. W. Pohlman, A. H. Brown, Jr., and Z. B. Johnson, *University of Arkansas, Fayetteville.*

USDA Select and Choice (n=22) striploins were enhanced with trisodium phosphate in combination with salt, BHA/BHT and CLA to determine the impact of sensory and quality attributes. There were 10 Choice and 12 Select striploins used and analyzed in an oneway ANOVA. Treatments were: Choice control (n=5) (non-inject) (CC), Choice inject (n=5) (0.4% trisodium phosphate, 0.5% salt and 0.006% BHA/BHT) (CI), Select inject (n=4) (0.4% trisodium phosphate, 0.5% salt and 0.006% BHA/BHT) (SI), Select inject + CLA (n=4) (0.4% trisodium phosphate, 0.5% salt, 1.3% CLA and 0.006% BHA/BHT) (CL), and a Select control (n=4) (non-inject) (SC). All injected treatments were injected to 110% of their original weight. Injected treatments allowed for lower (P < 0.05) WBS, cooking loss, and lower retail purge. Injected treatments also allowed for greater (P < 0.05) myofibrillar and overall tenderness values, and lower (P < 0.05) connective tissue values when sampled by trained panelist. The injected treatments were also juicer (P < 0.05) than the two controls. There was a general decline during retail display for all of the instrumental color measures except for hue angle which had a general increase in value. There were no treatment differences (P > 0.05) in regards to b*, a*, hue angle, and saturation index. There were differences however in L* values where CL had the highest mean and was different (P < 0.05) from CI and SI. Treatment CL was not different (P > 0.05) from any of the other treatments for 630/580 nm, however, SI and CI did not differ (P > 0.05), but both were different (P < 0.05) from CC and SC. Marbling scores differed among the treatments with CC, SC, and SI not differing (P > 0.05) and CI and CC not differing (P > 0.05). However, CL differed (P < 0.05) from all other treatments having a higher score due to the CLA adding artificial marbling. This data suggest that through enhancement, overall palatability and marbling scores can be improved.

Key Words: Beef, CLA, Sensory

M57   Predicting beef tenderness using proteomic analysis of 36 hour postmortem muscle. M. S. Updike*, I. Zapata, H. Zerby, and M. Wick, *The Ohio State University, Columbus.*

Inconsistency in tenderness has been described as the biggest factor negatively impacting beef palatability, significantly harming the beef industry. Currently, carcasses are sorted into palatability classes using quality grade, a score based on physiological age and intramuscular fat, which is slightly correlated to tenderness. A method that would rapidly and accurately predict tenderness would be an advantage to the beef industry. The long term goal of our laboratory is to create an immunochemical test strip which can accurately predict tenderness for consumers (7-14 d postmortem) when the carcasses move from the cooler for fabrication (24-48 h postmortem). Previous research from our lab used bovine myofibrils from 36 h to predict 7 d tenderness as proof of principle. To expand upon that research, 34 Angus cross steers were harvested at The Ohio State University meat lab. Samples of Longissimus dorsi were taken at 36 h postmortem for proteomic analysis and sarcomere length determination. Steaks were assayed for tenderness using Warner Bratzler sheer (WBS) force at 7 and 14 d

postmortem. Sarcomere length determination samples were dissected and fixed in a glutaraldehyde/cacodylic acid buffer. Samples were homogenized in cacodylic acid buffer, mounted on glass slides, observed by phase contrast microscopy and images captured with a CCD camera. Proteomic analysis samples underwent principle component fractionation using a high salt extraction. Both the high salt soluble fraction and the high salt insoluble fraction were solublized and run on SDS-PAGE using 5-20% gradient polyacrylamide gels. The resulting images were analyzed and the percent that each band contributed to the total was used in a reverse step wise regression on the WBS force value and on the sarcomere length. Ten bands from 36 h samples were identified that are associated with and predictive of 7 and/or 14 d tenderness ($r^2 = 0.76$, $p \leq 0.01$). Five bands were identified that are associated with the sarcomere length ($r^2 = 0.66$, $p \leq 0.01$). These results suggest that an immunochemical test strip could accurately predict tenderness of beef when it is consumed at 7 to 14 d postmortem.

Key Words: Beef, Tenderness, Proteomics

M58 Evaluation of different fatty acid methyl ester preparation procedures for analysis of egg fat with emphasis on omega-3, omega-6 and conjugated linoleic acids. G. Cherian*, A. S. Abd El-Hakim, and M. P. Goeger, *Oregon State University*, *Corvallis*.

With the availability of different brands of fatty acid modified eggs on the market, accurate methods to measure fatty acid content in eggs is needed. Fatty acids are usually analyzed as their methyl esters (FAME). In the current study, three different FAME preparation procedures were compared using regular, omega-3, or conjugated linoleic acid (CLA)-enriched eggs. Lipids from egg yolk were extracted with chloroform:methanol (2:1) and an aliquot (0.5 ml) dried under N2 at 40C. In Method 1, methanolic HCl (1 ml) was added to the lipid extract and heated at 60C for 40 min. In Method 2, hexane (2 ml), methyl acetate (0.04 ml) and methylating reagent (0.04 ml) [1.75ml methanol, 0.4 ml sodium methoxide (5.4 mol/L)] were added to the lipid extract, allowed to stand 10 min at room temperature then combined with stopping reagent (0.06 ml) [0.1g oxalic acid in 3.0 ml diethyl ether] and centrifuged at $2400 \times g$ for 5 min. In Method 3, lipid extract and methylating reagent (2 ml) [45% methanol, 35% boron trifluoride, 20% hexane] were heated at 90-100C for 60 min. FAME was extracted with distilled water and hexane. An internal standard (C19:0) was used for quantification. Highest recovery of alpha-linolenic acid (18:3n-3), linoleic (18:2n-6), cis9, trans11 and trans10, cis12 CLA was obtained with Method 3 (P<0.05). No difference was found in the docosahexaenoic acid (DHA, 22:6n-3) content of regular eggs with the three methods tested. Recovery of DHA for omega-3 eggs was best with Method 3 (P<0.05). Lowest recovery of DHA for CLA-enriched eggs was obtained with Method 1 (P<0.05). The current study shows that FAME preparation methods should be based on the egg type and the experimental objectives.

Key Words: Egg, Fatty Acid Methyl Ester, Omega-3

M59 Effect of animal, transportation, and slaughterhouse variables on beef behavior at the slaughterhouse. N. Mach*[1], A. Bach[2,1], A. Velarde[3], and M. Devant[1], [1]*IRTA, Barcelona, Spain*, [2]*ICREA, Barcelona, Spain*, [3]*IRTA, Girona, Spain*.

To evaluate the influence of factors related to animal, transportation and animal handling at the slaughterhouse, as well as their interactions, on behavior of beef cattle at the slaughterhouse, a total of 1,633 beef cattle were monitored. A scan sampling of 182 pens (9.13 ± 3.94 animals/pen) with a 30-min interval was conducted 3 times per pen, to study the lying, drinking, exploring, and ruminating behaviors. Mounting behavior was registered continuously during 15 min. A Poisson regression model was conducted with 5 variables to identify the main factors, and their interactions, affecting the incidence of each studied behavior at the slaughterhouse. Lying, drinking, exploring behaviors were not affected by the factors studied, and no statistical interactions were observed. Average incidence of animal mountings and ruminating behavior were 0.9 ± 0.12, and 0.66 ± 0.04 cases per pen, respectively. The incidence rate ratio (IRR) of mountings was 4.54 times greater (P < 0.001) in males than in females. Furthermore, the IRR of mountings was 1.28 times greater (P < 0.01) in medium (0.19 to 0.35 animal per m^2) and 0.57 times lower in high (≥ 0.27 animal per m^2) than in the low (≤ 0.19 animal per m^2) stocking densities at slaughterhouse. In contrast, ruminating behavior was greater (P < 0.001) in females than in males (IRR = 1.68), and slightly decreased (P < 0.05) as waiting time at the slaughterhouse increased from 4 to above 12 h (IRR = 0.66), being reduced 34% when animals waited over 12 h at slaughterhouse. Handling decisions such as optimizing stocking densities and waiting time at the slaughterhouse may reduce the incidence of mountings and improve rumination time. Additionally, both behaviors were affected by gender.

Key Words: Beef, Behavior, Pre-slaughter Handling

M60 Effects of dietary vitamin A on growth and beef quality traits of Limousin × Chinese Luxi steers. J. Q. Wang*, F. C. Wan, D. P. Bu, H. Y. Wei, and L. Y. Zhou, *State Key Laboratory of Animal Nutrition, Institute of Animal Science, Chinese Academy of Agricultural Sciences*, *Beijing, China*.

Thirty two (11±0.5mo; 310±10.35 kg) Limousin × Chinese Luxi steers were allotted to one of four dietary treatments(n=4) in two trials with a randomized complete design to evaluate the effects of supplementation of vitamin A on growth, carcass trait, beef quality and chemical composition. Steers were fed a basal diet supplemented with 0 (A0),1100 (A1100), 2200 (A2200), or 4400 IU (A4400) of vitamin A (palmitate retinyl ester, IU /kg DM) for 90d(Exp 1) or 180d(Exp 2). At the end of finishing , 3 steers of each treatment were transported to a commercial slaughter facility. HCW(Hot carcasses weight) were measured and marbling scores(MS) were recorded according to JMGA grading system. Samples of longissmus muscle(LM) were taken at 7-12 ribs of each right side carcass and water holding capacity(WHC) was measured. Warner-Bratzler shear force(WBSF) was evaluated using 7- to 8-cm thick steaks. Chemical composition of intramuscular fat, moisture, protein, and ash of LM were determined according official methods. Lipid oxidation determined as thiobarbituric acid-reacting substances (TBA).HP (heme pigment) and DL (drip loss) of steaks were measured at 168h of aging period. No treatment difference(p>0.05) were observed for dry matter intake(DMI),average daily gain(ADG),feed gain ratio (F/G) and chemical compositions of LM. MS for carcass in Exp 2 were 6.00[ab],7.33[a],5.00[b] and 5.67[b]in A0,A1100,A 2200 and A 4400(p=0.04) respectively.Decreased dietary vitamin A concentration improved the drip loss (DL), antioxidant ability of the fat and water holding capacity(WHC) in Exp 1. However, dietary VA level had no apparent effect(p>0.05) on most meat quality traits.

Table 1.

Item	A0	A1100	A2200	A4400	SEM	p
Exp 1						
TBA168[*]	0.53	0.51	0.63	0.84	0.091	0.11
HP168[*]	13.17	15.40	13.76	13.58	1.10	0.53
WBSF,kg	7.96	6.87	6.25	8.81	1.17	0.28
WHC,%	19.77[b]	27.18[a]	25.77[a]	25.78[a]	1.49	0.03
HCW,kg	184	184	192	194	7.88	0.74
Exp 2						
TBA168[*]	0.87	0.75	0.65	0.72	0.13	0.65
HP168[*]	12.76	12.57	11.90	14.78	1.47	0.57
WBSF,kg	7.36	5.88	5.62	9.36	1.31	0.24
WHC,%	26.77	24.32	26.87	27.42	2.04	0.57
HCW,kg	211	224	214	206	7.86	0.47

[*]mg/100g. [abc]Means within a row with unlike superscripts differ(P<0.05)

Key Words: Vitamin A, Beef Quality Traits, Chinese Luxi Cattle

M61   Effects of supplemental fat on growth performance and quality of beef from steers fed corn finishing diets. M. L. Nelson*, J. R. Busboom, C. F. Ross, and J. V. O'Fallon, *Washington State University*, *Pullman*.

To measure effects of dietary fat on feedlot performance, carcass characteristics, and beef appearance, moisture binding, shelf life, palatability and fatty acid content, 126 crossbred beef steers (321.1 ± 0.57 kg) were allotted to a randomized complete block design with a $3 \times 2 + 1$ factorial arrangement of dietary treatments. Main effects were level of yellow grease (0, 3 or 6%) and alfalfa hay (3.5 or 7%) in corn-based diets containing 15% potato byproduct (PB). The added treatment was 6% tallow and 7% alfalfa in a barley-based diet containing 15% PB. Dry matter intake and ADG were not affected by diet, however G/F and diet NE content increased linearly ($P \leq 0.10$) as yellow grease increased. Kidney, pelvic, and heart fat (2.0 to 2.3 ± 0.07) and yield grade (2.8 to 3.1 ± 0.09) increased linearly ($P \leq 0.05$) as yellow grease increased. Yellow grease fed steers had lower ($P \leq 0.05$) beef firmness and beef texture scores but greater ($P \leq 0.01$) fat color score than those fed tallow. Moisture retention of beef was not affected by dietary treatment except purge score during retail storage was decreased linearly ($P \leq 0.01$) 2.1 to 1.6 ± 0.06 by level of yellow grease. Steaks from barley plus tallow fed steers had greater ($P \leq 0.05$) shear force than those from steers fed corn plus yellow grease. But beef flavor increased linearly ($P \leq 0.05$) from 6.2 to 6.7 ± 0.11 as yellow grease increased. Level of yellow grease decreased linearly ($P \leq 0.01$) vaccenic acid but increased linearly ($P \leq 0.01$) transvaccenic acid (TVA) and CLA content of beef. Beef from corn plus yellow grease-fed steers had lower ($P \leq 0.05$) palmitoleic and oleic acids and greater ($P \leq 0.05$) linoleic, TVA, and CLA than beef from barley-tallow fed steers. Feeding yellow grease increased diet energy content which increased carcass fatness, altered beef fatty acid content which increased beef flavor without affecting moisture retention, shelf-life, or cooking properties of the beef. Additionally, beef from corn plus yellow grease-fed steers was more tender and had more unsaturated fatty acid content and CLA than of beef from barley plus tallow-fed steers.

Key Words: Beef Cattle, Yellow Grease, Fatty Acid

M62   Influence of β-adrenergic agonist (Metaproterenol) and lysine on growth, carcass quality in broiler chickens. A. M. Tahmasbi*[1], E. Kasefi[2], G. Moghadam[2], A. Taghizadeh[2], and H. A. Ghasemi[2], [1]*University of Mashhad, Iran*, [2]*University of Tabriz, Iran*.

An investigation was made to find out the importance of β-adnergenic and lysine on carcass characteristics and blood metabolite of 648 broiler chickens from 21–42 days of age. Effect of metaproterenol (a β2- adrenergic agonist) and lysine were assessed by mixing them in feed at 0.0, 0.25, 0.50 and 1.00 ppm metaproterenol sulfate and 100%, 115% and 130% of NRC recommended lysine in a 4–3 factorial arrangement of treatments. Chickens were reared under normal condition to 3 week of ages and then randomly allocated to treatments. Each treatment contained 3 pens with 18 birds/pen. Body weight gains (BWG), feed conversion ratio (FCR) abdominal fat pat (AFP) breast weight (BW) were measured. Result indicate that during 4th and 5th week of study using metaproterenol (0.5 ppm), compare to control group, improved BWG (5.1%), carcass efficiency (3.4%) and breast weight (2.2%), breast and thigh muscle protein and depressed abdominal fat (P<0.05). Increasing lysine levels lead to significant increase in body weight gain, carcass weight, carcass efficiency, breast muscle weight (P<0.5), but it has no effect on feed intake, feed conversion ratio, blood metabolites. Data from this experiment suggested that both adding 0.5 ppm β-adrenergic agonist metaproterenol sulphate significantly improved birds performance and their carcass quality and the most efficient lysine level for broiler chickens was proved to be 115% NRC recommended.

Key Words: Broiler, Adrenergic Agonis, Carcass Composition

M63   Effect of deboning time and muscle type on dielectric properties of uncooked chicken breast meat at 5°C. H. Zhuang*, S. Nelson, S. Trabelsi, and E. Savage, *Agriculture Research Service, USDA, Athens, GA*.

Color, pH, water-holding capacity and texture (or tenderness) are the most commonly-used quality indicators for chicken meat, and they can be significantly affected by deboning time and muscle type. So far, little attempt has been made to assess and monitor these quality indicators during processing at a refrigerated temperature by using rapid and non-destructive instrumental methods. Dielectric properties measurements have potential to assess raw meat quality nondestructively. The objective of this study was to determine the effects of muscle type and deboning time on dielectric properties of uncooked chicken breast meat at 5°C. The dielectric properties, consisting of the dielectric constant and loss factor, were measured with an open-ended coaxial-line probe and impedance analyzer for uncooked chicken breast muscle Pectoralis major and Pectoralis minor, deboned at 2- and 24-h postmortem, at frequencies of 10, 26, 900 and 1800 MHz and 5°C. The quality indicators were also measured. Our study shows that there are no differences in the dielectric constant and loss factor values for the two deboning times or for the two muscle types. However, the deboning time significantly (p < 0.1) affects the average values of the loss tangent (dielectric loss factor/dielectric constant) at frequencies 26, 900 and 1800 MHz, and the muscle type significantly (p < 0.1) affects the loss tangent at 900 MHz. The deboning time and/or muscle type have also significant effects (p < 0.05) on the quality indicators, color (L* value), pH, water-holding capacity, drip loss, and texture (Warner-Bratzler shear force value). These results suggest that there is a potential for using dielectric

properties measurements, or specifically the loss tangent, to assess the quality, deboning time, and/or muscle types of chicken meat at a refrigerated temperature during the processing. Further studies are needed to determine the relationships between dielectric property measurements and the quality indicators, deboning time and muscle types.

M64 Rabbit meat quality as affected by feed containing coconut meal. D. V. Souza[1], J. F. F. Zapata*[1], E. R. Freitas[1], D. S. Garruti[2], E. M. C. Silva[1], T. F. Vidal[1], and A. L. F. Pereira[1], [1]*Universidade Federal do Ceará, Fortaleza, CE, Brasil*, [2]*Embrapa Agroindústria Tropical, Fortaleza, CE, Brasil*.

The objective of this work was to assess the effect of feeding rabbits (White New Zeeland × Californian) with diets containing coconut meal (CM) on meat proximal composition (moisture, protein, fat and ashes), pH, color (components L*, a* and b*), water holding capacity (WHC), cooking losses (CL), shear force (SF) and fatty acid profile. The experiment utilized 60 rabbits in a complete randomized design with diets containing five levels of CM: 0% (control diet), 6.25, 12.5, 18.75 and 25.00%) and 12 animals per treatment. Increasing levels of CM in the diet did not affect ($p \geq 0.05$) meat proximal composition, pH or CL, but it showed a quadratic effect on meat WHC and a linear effect on meat SF. Diets containing 25.00% CM produced meat with lower ($p \leq 0.05$) WHC and those containing 18.75 and 25.00% CM produced meat with higher ($p \leq 0.05$) SF than that from the control diet. Meat color component a* in meat from diets containing 12.5, 18.75 and 25.00% CM was higher ($p \leq 0.05$) than that from the control diet. Meat color component b* was linearly affected by CM levels and all diets containing CM produced meats with higher ($p \leq 0.05$) b* values than that from the control diet. The levels of palmitoleic, stearic, and linolenic acids in the meat were linearly affected by CM levels in the diets. When compared to the levels of fatty acids in the meat from the control diet, palmitic acid was lower ($p \leq 0.05$) in the meat from all diets containing CM; myristic acid and stearic acid levels were higher ($p \leq 0.05$) and palmitoleic acid level was lower ($p \leq 0.05$) in the meat from the diet containing 25.00% CM; and linolenic acid level was lower ($p \leq 0.05$) in meats from diets containing 18.75 and 25.00%. The relation P/S in the meat decreased ($p \leq 0.05$) when rabbits were fed the 18.75 and 25.00% CM diets suggesting that these levels of inclusion increase the saturated fatty acid content in rabbit meat.

M65 Fatty acid profile of *Longissimus* by steers finishing at *Brachiaria brizantha* cv. Stapf. pasture, under tropical conditions. D. M. Lambertucci*[1], R. H. T. Buschinelli de Goes[2], A. B. Mancio[1], C. Mistura[3], and R. P Lana[1], [1]*Universidade Federal de Viçosa, Viçosa, Minas Gerais, Brasil*, [2]*Universidade Federal da Grande Dourados, Dourados, Mato Grosso do Sul, Brasil*, [3]*Universidade do Estado da Bahia, Juazeiro, Bahia, Brasil*.

The chemical composition and the fatty acids profile of *Longissimus* muscle of Nellore steers (NL) and its crossbreeds with Simental (SI) and Santa Gertrudis (SG) finished in pastures of *Brachiaria brizantha* cv Stapf, were evaluated. They were studied 14 animals carcasses, with live weight of 481+30 kg, receiving 1.1 kg of supplement/day, containing 24% of CP. Among to 12nd and 13rd rib, a sample of the *Longissimus* muscle was removed. The pasture of *Brachiaria brizantha* presented low tenor of saturated fatty acids (29.69%), high tenor of omega 3 acid (28.21%). The crossbreed with Santa Gertrudis presented smaller saturated fatty acid tenor (SFA), of (45.47%), if compared with Nellore and Simental, 48.15 and 47.96%, respectively. The tenors of the linoleic conjugated acid (CLA) and omega-3 acid (mg/100g muscle) were higher in Nellore steers, presenting values of 1.27% of CLA and 2.09% of omega-3 acid, while the animals Santa Gertrudis and Simental presented values of 1.03 and 1.16% of CLA and 1.81 and 1.56% of omega-3 acid, respectively. There was no difference among the genetic groups for the polyunsaturated acids (PUFA) and monounsaturated acid (MUFA), as well as for the omega-6 acid. The average for the PUFA was of 7.7%. The average of the tenor of observed SFA was of 47.19%, and the relationship among PUFA/SFA was of 0.16. The total CLA was significant ($P < 0.05$) for the Santa Gertrudis steers (64.22%) in relation to the Simental (46.69%) and Nellore steers (41.68%). The linoleic conjugated acid (18:2 c-9, t-11; 18:2 c-11, t-13 and 18:2 t-10, c-12) followed a similar behavior, being verified the CLA 18:2 c-9, t-11 for samples of muscle of the Santa Gertrudis steers were 61.92% higher to Nellore steers; for the CLA 18:2 c-11, t-13, the difference was of 56.32%; and for the CLA 18:2 t-10, c-12 the difference was of 52.11%.

M66 Phenotypic correlation of egg weight and egg morphometric measures. O. T. F. Abanikannda[1], A. O. Leigh[1], O. Olutogun[2], L. A. Ajayi*[1], and M. Orunmuyi[3], [1]*Lagos State University, Ojo, Lagos State, Nigeria*, [2]*University of Ibadan, Oyo State, Nigeria*, [3]*Ahmadu Bello University, Zaria, Kaduna State, Nigeria*.

Weight and morphometric measurements were taken on table eggs from Harco heavy breed layers in the humid tropics of Lagos, Nigeria. Statistical descriptive measures and relationships between egg weight (EGGWT), egg length (EGGLT), egg width (EGGWD) and egg shape index (SHPINDX) were studied. A total of 2951 eggs were obtained from layers at five different age groups in lay. The descriptive statistics are presented in the table below. Egg weight and egg width exhibited similar pattern in their distribution across the different age groups, with steady increase from age group A (22 - 32 weeks), peaked at age group D (55 - 65 weeks) before a decline afterwards. Egg length consistently increased with increasing age of hen, while shape index consistently decreased with increasing age of hen. Correlation between egg weight & egg length, egg width and shape index was 0.78, 0.84 and -0.07 respectively, while the correlation between egg length & egg width and shape index was 0.53 and -0.60 respectively, and between egg width and shape index was 0.37. The fitted model of the study was EGGWT = -124.72 + 1.65EGGLT + 1.32EGGWD + 0.43SHPINDX. All coefficients obtained were significant ($P<0.05$), however, it was observed that egg length and egg width were better predictors of egg weight when compared to shape index. Analysis of variance revealed that effects of all factors studied (age group, egg length, egg width, shape index and egg length × egg width interaction) were highly significant ($P<0.01$) on egg weight except for shape index which was significant ($P<0.05$). A further separation of the means for all the variables studied across the five age groups was done using Tukey's method. Morphometric measures studied were good predictors of egg weight.

Table 1. Mean ± S.E. of the Correlates Studied Across Age Groups

Age Group (Weeks)	N	Egg weight (g)	Egg length (mm)	Egg width (mm)	Shape Index (%)
A (22–32)	596	49.94±0.20[c]	53.86±0.09[d]	40.91±0.06[d]	76.02±0.12[a]
B (33–43)	599	56.35±0.18[b]	56.17±0.09[c]	42.53±0.05[c]	75.79±0.12[ab]
C (44–54)	564	75.79±0.12[b]	56.65±0.11[b]	42.77±0.07[bc]	75.58±0.13[ab]
D (55–65)	596	58.63±0.23[a]	57.27±0.11[a]	43.16±0.08[a]	75.47±0.16[b]
E (66–76)	596	58.05±0.19[a]	57.43±0.10[a]	42.90±0.05[b]	74.81±0.13[c]
Combined	2951	55.99±0.11	56.27±0.04	42.45±0.03	75.53±0.06

Key Words: Shape Index, Morphometric Measures, Egg

M67 Effect of vitamin D₃ supplementation on plasma and muscle calcium levels, tenderness and sensory characteristics of crossbred grazing steers in the tropics. J. Gutierrez, L. Machado, O. E. Moron-Fuenmayor, O. E. Araujo-Febres*, and S. Pietrosemoli, *La Universidad del Zulia, Maracaibo, Estado Zulia, Venezuela*.

Sixty large framed, *Indicus × Continental*, crossbred beef steers grazing in a tropical dry forest environment, were used to investigate the effect of supplementing diets with various levels of vitamin D_3 (VITD) to provide 0, 6, and 10 million IU/(steer×d) for 8 d before slaughter on plasma (PCa) and *Longissimus lumborum* muscle Ca^{2+} (MCa) concentrations, texture analysis (TX), and sensorial analysis of the organoleptic qualities, in which appearance (A), odor (O), flavor (F), juiciness (J), amount of connective tissue (CT), and tenderness (T). Steers were slaughtered using an approved humane technique. A randomly subsample of five steers of the three individual VITD treatments (n = 15) was chosen for meat quality and palatability analyses. Following a 24-h chilling period -4°C, carcasses (a randomly selected subsample n=15) were ribbed, one strip loin of *Longissimus lumborum* (LL) muscle was removed from each carcass. Steaks were vacuum-packed. The data were analyzed in a completely randomized design using the General Linear Models procedures. Warner-Bratzler shear force (WB) was measured on strip loin at 7 d postmortem. Steaks for WB and sensory evaluation were thawed to 2°C. Blood plasma Ca^{2+} and muscle Ca concentration of cattle treated with VITD were higher (P < .05) than controls. VITD supplementation did not (P > .05) affect TX. Sensory traits of appearance, odor, flavor, juiciness, connective tissue, and tenderness were improved (P <.05) by all VITD treatments in LL steaks. Treatment with VITD will effectively improve tenderness in grazing zebu cattle in tropical conditions.

Key Words: Beef, Vitamin D, Tenderness

M68 Evaluation of freshness of egg yolks and shell eggs stored under the super chilled temperature through analyses of changes of volatiles and lipoprotein conformation. T. Yanagisawa*[1], C. Watanuki[1], M. Ariizumi[1], Y. Shigematsu[1], H. Kobayashi[1], M. Hasegawa[1], and K. Watanabe[2], [1]*Q.P. Corporation, Tokyo, Japan*, [2]*Tokyo University of Agriculture, Kanagawa, Japan*.

This study evaluated freshness of egg yolks and shell eggs stored under the super chilled temperature range (-5-0°C) by analyzing changes in volatiles affecting their flavors and lipoprotein conformation affecting their emulsifying characteristics. As the samples, 10% salted egg yolks were stored at -30, -20, -15, -5 and 5°C, and shell eggs were stored at 0, 10, 20°C with different carbon dioxide concentrations in packages. To analyze volatiles, those samples were incubated and generated headspace gas was absorbed on solid phase microextraction (SPME) fiber and obtained volatiles were analyzed using gas chromatography-mass spectrometry (GC-MS). The analyses demonstrated that amount of volatiles such as hexanal considered to generate by lipids oxidation was the smallest in the samples stored at the super chilled temperatures for both salted egg yolks (-5 and 5°C) and shell eggs. Generation of volatiles in shell eggs was also suppressed at higher carbon dioxide levels. For salted egg yolk samples, conformational changes of lipoproteins were observed using ^{31}P nuclear magnetic resonance (NMR) spectroscopy, as the changes of peaks of phosphorus atoms of phospholipids in the lipoproteins. The alterations of the peaks of the super chilled egg yolks were smaller than those of egg yolks stored at the lower temperatures. The results suggested that there are less conformational changes of lipoproteins at the super chilled temperature (-5°C). It has been also confirmed that the shell egg samples stored at the super chilled temperature range maintained high freshness from the Haugh Unit values and the pH values of their egg white. This study demonstrated effectiveness of super chilling storage for maintaining freshness of salted egg yolks and shell eggs by new analytical methods.

Key Words: Egg, Super Chilling Storage, Freshness

Extension Education - Livestock and Poultry

M69 StockPlan: Decision support tools for exploring management options for drought. M. J. McPhee*[1], G. Meaker[1], P. M. Graham[1], B. L. Davies[1], and M. B. Whelan[2], [1]*NSW DPI, Armidale, Australia*, [2]*Southern Cross University, Lismore, NSW, Australia*.

StockPlan® is a suite of activities that can be undertaken during workshops and subsequently at home. It is highly recommended that StockPlan® is taken as a workshop. The StockPlan® resources include: StockPlan® Basics-Producer Manual; StockPlan® Extras – Home Study Guide; the Resources CD; StockPlan® CD and the StockPlan® User Manual. This study describes the 3 StockPlan® decision support tools (DST; Drought Pack, Feed Sell Agist (FSA) Pack, and ImPack) that include the StockPlan® User Manual to assist producers and extension staff test out management strategies for sheep or cattle through a projected period of limited pasture or drought. **Drought Pack** can help producers or extension staff choose between different strategies when faced with a period of limited or severely reduced pasture supply. The DST assesses the likely financial consequences of various strategies and looks at the impact of each strategy by varying the length of time that pasture may be limited. The DST also estimates the likely cost to repurchase stock when the drought ends. **FSA Pack**