Undergraduate Student Competition

1   Increased meat goat production through anestrous doe management. L. L. Schneider*[1] and R. L. Stanko[1,2], [1]*Texas A&M University-Kingsville,* [2]*Texas A&M University Agricultural Research Station.*

We evaluated the production of crossbred meat goat does programmed to kid every 8 mo. Does (n=48) were synchronized to be bred during anestrous (June ′02). From this group, Boer (B), Spanish (S), B x S, and B x Alpine does (n=23) were continued on the accelerated kidding program (AK) and bred during the next anestrous (Feb. ′03; AK 1). Remaining does (n=16/23) were joined with bucks (n=2) during normal season (Oct./03; AK 2). Does (n=15/16) continued the program and were bred during anestrous (July ′04; AK 3). Anestrous was confirmed (AK 1 and 3) by serum progesterone, 3 wk prior to treatment. Does in AK 1 and 3 received melengestrol acetate (MGA; 0.25mg/hd/d) and male exposure for 14 d. After treatment, does were exposed to bucks (n=2) for 30 d. Mean pregnancy rate (PR), kid crop (KC; kids/doe), birth weight (WB, kg), % weaned (#weaned/#born, W), and weaning weight (WW; kg) was evaluated. PR was similar in AK 1 and 3 (65.2 vs. 66.6%) and were lower (P< 0.05) than AK 2 (100%). Thus far KC, WB, W, and WW are similar (P>0.1) in AK 1 and 2, 2.50±0.4 vs. 2.4±0.2, 3.5±0.1 vs. 3.9±0.1, 87.9 vs. 89.5%, and 13.3±0.5 vs. 15.3±0.6. Additional lactating (n=11), dry (n=13), and virgin (n=5) %B, %S, and S does were utilized in a second study to characterize serum LH in the anestrous doe. Does were allocated by status and genetics into 2 groups. Does were bled weekly for 4 mo. and then every 48 to 72 h one mo. prior to treatment to confirm anestrous. Does in group 1 (n=16; MGA-M) were fed MGA (0.25mg/hd/day) and exposed to a male for 14 d. After treatment, bucks (n=2) and does were joined for 30 d. Remaining does (n=13; CON) were on pasture without male exposure. To determine serum LH characteristics, a subset of MGA-M (n=7) and CON (n=5) does were bled every 15-min for 6 h beginning 76 h from last MGA. Mean serum LH (ng/mL), LH pulse frequency (pulses/6h), and LH pulse amplitude (ng/mL) were similar (P>0.1) between CON and MGA-M does, 0.63±0.1 vs. 0.55±0.07, 1.4±0.4 vs. 2.14±0.3, and 1.85±0.3 vs. 1.30±0.1, respectively. All MGA-M does expressed estrus, ovulated, and confirmed PR was 75% following treatment. Management of anestrous does is a viable means to improve production.

Key Words: Goats, Anestrous, Melengestrol Acetate

2   Validation of spectrophotometric methods for determining sperm concentration in ram and bull semen. E. L. Chamberlain*[1] and R. W. Godfrey[2], [1]*Department of Animal Sciences, Louisiana State University,* [2]*Agricultural Experiment Station, University of the Virgin Islands.*

This project was conducted to determine if sperm concentration (CONC) in bull and ram semen can be measured using a spectrophotometer (SPEC) or a plate reader (PR). A hemacytometer was used to determine CONC of serial dilutions (n = 6) of ram and bull semen. Absorbance (ABS) of samples was measured with a SPEC (550 nm) and PR (405, 450, 490 and 650 nm). A linear regression of CONC vs. ABS was done for the SPEC and PR for each species. The ABS of diluted (1:50, 1:100 and 1:200) ram and bull semen (n = 10/species) was measured and converted to CONC using the prediction equations and compared to CONC values obtained using the hemacytometer. Accuracy was calculated as the absolute value of the difference between CONC determined using the hemacytometer and CONC determined using the SPEC or PR. Accuracy was analyzed using GLM procedures of SAS within species. Regression analysis resulted in linear equations for the relationship between CONC measured with the hemacytometer and ABS within each species and method ($r^2 = 0.99$; P < 0.0001). Concentrations determined using the hemacytometer were highly positively correlated with concentrations found using spectrophotometric methods (r > 0.95, P < 0.0001) in each species. For ram semen, accuracy was better (P < 0.06) for the SPEC than for the PR at any wavelength in samples diluted 1:50 and 1:100. There was no difference (P > 0.10) in accuracy between SPEC and PR methods for ram semen diluted 1:200. Accuracy was better (P < 0.03) in ram semen diluted 1:200 than in semen diluted 1:50 within PR and SPEC methods. For bull semen, there was no difference (P > 0.10) in accuracy between SPEC and PR methods at any wavelength in each dilution. Accuracy was better (P < 0.02) in bull semen diluted

1:200 than in semen diluted 1:50 within PR and SPEC methods. These results indicate that concentration of ram and bull semen, diluted 1:200, may be determined through spectrophotometric methods.

Key Words: Semen, Bull, Ram

3 **Castration and concentrate feeding influence performance and carcass characteristics of meat goats.** S. R. Johnson*, M. H. Poore, A. D. Shaeffer, S. R. Freeman, H. M. Glennon, and J.-M. Luginbuhl, *North Carolina State University*.

There has been a recent growth in the meat goat industry, but unfortunately there is little knowledge about optimal production management practices. This project studied the post-weaning growth of buck kids or wether kids fed orchardgrass hay only (Hay; 10.6% CP, 39.9% ADF, 0.4% Ca, 0.3% P) or hay plus Cooperative Research Farms Pelleted Meat Goat Ration (17.9% CP, 15.8% ADF, 1.2% Ca, 0.61% P). The concentrate was either hand-fed at 2% of body weight (HF) or fed free-choice (FC). The goats (at least 75% Boer) were born at the NCSU Small Ruminant Unit and were randomly selected to be bucks or wethers. After weaning, 18 bucks (initial wt 19.7 kg) and 18 wethers (initial wt 17.0 kg) were divided evenly among the 3 treatments in a 2x3 factorial arrangement. The goats were fed for 85 days and on day 86 the carcasses were harvested, at approximately 6 months of age. No severe digestive upsets were noted during the trial. There were few interactions so only main effects are presented in the table below. The study showed bucks outperformed wethers and that FC produced the highest level of performance and the most desirable carcasses.

Variable	Buck	Wether	Hay	HF	FC
Average Daily Gain, kg/d	0.138[a]	0.105[b]	0.048[c]	0.109[d]	0.207[e]
Hay DMI, g/d	345[a]	305[b]	503[c]	343[d]	129[e]
Total DMI, g/d	800[a]	685[b]	503[c]	731[d]	992[e]
Gain:Feed	0.158[a]	0.142[b]	0.096[c]	0.145[d]	0.208[e]
Hot Carcass Wt, kg	15.7[a]	13.0[b]	9.0[c]	14.3[d]	19.7[e]
Carcass Grade	2.33	2.56	3.45[c]	2.33[d]	1.56[e]
Dressing Percentage	49.0	49.1	40.2[c]	51.5[d]	55.4[e]
Loin Eye Area, sq cm	9.42[a]	8.13[b]	5.24[c]	8.58[d]	12.58[e]
Kidney/Pelvic Fat, % of carcass	2.97	3.12	1.61[c]	3.38[d]	4.15[d]

[a,b]Indicates bucks and wethers differ (p<.05); [c,d,e] indicate the diets differ (p<.05)

Key Words: Meat Goats, Castration, Carcass

4 **Improving voluntary feed intake by the sow during lactation.** C. W. O'Gorman*[1], J. Miller[1], J. W. Rounsavall[1], F. Neher[2], and J. C. Laurenz[1], [1]*Texas A&M University-Kingsville*, [2]*Biomin, Inc.*

Voluntary feed intake by the sow during lactation is frequently inadequate to meet nutrient demands resulting in excessive weight loss, decreased milk production and depressed pig performance. This study investigated the use of a palatability enhancing product (PEP®1000; Biomin, Inc., Herzongenburg, Austria) to improve sow feed intake and subsequent pig performance. Crossbred sows (n=47) were selected 14 days prior to farrowing and assigned by weight and parity to one of two treatments. Sows were fed a standard lactation diet containing either 0 (Control; n=24) or 2 kg/t PEP®1000 (PEP; n=23) beginning 10 days prior to farrowing and continuing through weaning at day 21 of lactation. At 2-4 days prior to farrowing, sows were moved to crates, individually fed, and daily feed intake (ADFI) recorded until weaning. After farrowing, all pigs were weighed and tattooed for permanent identification. Sows and pigs were then weighed at weekly intervals. By design, sows did not differ (P > 0.05) in initial weight (239 ± 6 kg) or parity (3.1 ± 0.3). Supplementation with PEP did not effect (P > 0.05) the number of pigs born live (9.6 ± 0.3), pig birth weight (1.4 ± 0.1 kg), or pigs weaned per litter (8.4 ± 0.3). As expected, ADFI for Control sows was lower in early lactation (week 1; 4.0 ± 0.2 kg/d) and increased (P < 0.01) up to day 15 of lactation (7.0 ± 0.4 kg/d). In contrast, PEP sows consumed more (P < 0.05) feed in early lactation (5.0 ± 0.3 kg/d) and reached peak ADFI earlier then control sows (7.1 ± 0.5 kg/d by day 9). As a result, ADFI over the entire lactation period was 15% greater (P < 0.05) in PEP vs. Control sows (6.2 ± 0.1 vs. 5.4 ± 0.1 kg/d, respectively). The enhanced ADFI in PEP sows resulted in less (P < 0.05) weight loss during the first week of lactation (8.1 ± 1.4 vs. 3.5 ± 1.6 kg for Control vs. PEP sows, respectively) and higher pig ADG

during the lactation period (214 ± 7 vs. 240 ± 9 g/d for pigs from Control vs. PEP sows, respectively). As a result, PEP sows weaned litters 12% heavier (P < 0.05) then Control Sows. These results demonstrate that PEP enhances voluntary feed intake by the sow during lactation and improves pig performance.

Key Words: Feed intake, Stress, Palatability

5 **Level and source of supplemental selenium in beef calves.** R. S. Fry*[1], E. B. Kegley[1], M. E. Davis[1], M. D. Ratcliff[1], D. L. Galloway[1], and R. A. Dvorak[2], [1]*University of Arkansas, Division of Agriculture,* [2]*Alltech*.

Selenium (Se) is deficient in many Arkansas soils; therefore, an experiment was conducted to evaluate the effects of two supplemental Se sources on performance, blood metabolites, and immune function. Thirty Angus crossbred steers (238 ± 3.2 kg) were blocked by weight, and assigned within block to one of 15 pens (2 steers/pen). Pens were assigned randomly within blocks to one of three dietary treatments consisting of a corn-soybean meal supplement devoid of supplemental Se (negative control, NC) or corn-soybean meal supplements providing 1.7 mg supplemental Se/d as sodium selenite (inorganic Se, ISe) or as Se yeast (Sel-Plex, organic Se, OSe). Steers were offered Se-deficient fescue hay (< 0.04 mg Se/kg) to allow for approximately 10% orts, and 1.1 kg/d (as fed basis) of the appropriate grain supplement. Data were analyzed with GLM (growth performance) or MIXED procedures of SAS; means were separated with an F-protected t-test. Level and source of supplemental Se did not (P = 0.49) affect ADG for the 105-d trial. By d 42, steers fed both sources of supplemental Se had greater (P < 0.05) blood Se concentrations than those fed the NC. On d 63 and 84, blood Se concentrations differed (P < 0.05) among all dietary treatments (NC < ISe < OSe), and on d 105 steers fed both sources of supplemental Se had greater (P < 0.01) blood Se concentrations than NC (day × treatment interaction, P < 0.001). There was a tendency (P = 0.15) for diet to affect in vitro macrophage function. Macrophages from steers supplemented with ISe phagocytized more (P = 0.06) pig red blood cells than macrophages from NC-steers, with macrophages from OSe supplemented steers being intermediate. Antibody response to vaccination for bovine respiratory viruses, or in vitro lymphocyte blastogenesis did not (P > 0.35) differ among diets. Both sources of supplemental Se increased blood Se concentrations, the organic source more rapidly than the inorganic source; however, Se level and source had minimal effects on immune function of weaned beef calves.

Key Words: Cattle, Selenium, Bioavailability

6 **Dehydroepiandosterone-sulfate (DHEAS) enhances immunization response to keyhole limpet hemocyanin (KLH) and ovalbumin (OVA).** J. Dominguez*[1], N. Burdick[1], T. H. Welsh, Jr.[2], and J. C. Laurenz[1], [1]*Texas A&M University-Kingsville,* [2]*Texas Agricultural Experiment Station-College Station*.

Previously we reported that oral supplementation of pigs with DHEAS enhanced the responsiveness of isolated lymphocytes to Concanavalin A. This study extends those results by determining if these *in vitro* effects are reflective of an enhanced immune responsiveness *in vivo*. Crossbred, female pigs (49 ± 2 kg) were assigned by weight to one of two treatments (n = 4 pigs / treatment) and fed either 0 (Control) or 1 mg DHEAS / kg body weight (Supplemented) twice daily (0800 and 1600 h) for 6 weeks. One week after the initiation of treatments, all pigs were immunized against keyhole limpet hemocyanin and ovalbumin (1 mg/ml each emulsified in Fruend's™ incomplete adjuvant). Blood samples were taken initially and at weekly intervals and serum concentrations of immunoglobulin G (IgG) determined using a commerically available ELISA (Bethyl Labs, Montgomery, TX). Relative concentrations of serum IgG for KLH and OVA were determined by a direct ELISA using purified KLH or OVA as the capture antigens with serum values expressed as a stimulation index (SI = O.D. of samples after immunization / O.D. of samples prior to immunization). As expected immunization resulted in a time-dependent increase (P< 0.01) in serum IgG concentrations with peak concentrations occurring 3 weeks post-immunization. Supplementation of pigs with DHEAS augmented (P < 0.05) serum IgG concentrations in response to immunization (18.4 ± 2.3 vs. 28.9 ± 2.2 mg/mL for Control vs. Supplemented pigs, respectively). Consistent with the total IgG response, immunization induced time-dependent (P < 0.05) increases in IgG specific for KLH and OVA with peak increases

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occurring three weeks post-immunization. Supplementation of pigs with DHEAS tended to augment (P < 0.10) the relative concentrations IgG specific for both KLH (4.1 ± 0.9 vs. 5.7 ± 0.5 SI, for Control vs. Supplemented pigs, respectively) and OVA (3.0 ± 0.6 vs. 4.2 ± 0.4 SI, for Control vs. Supplemented pigs, respectively). Collectively, these results indicate that oral administration of DHEAS may be beneficial for enhancing the response of pigs to immunization.

Key Words: Vaccine Response, Pigs, Immune Modulators

7   Effects of dexamethasone, and selenium and vitamin E on steers consuming tall fescue baleage. C. Garner*, M. Nihsen, Z. Johnson, D. Kreider, and C. Rosenkrans, Jr., *Department of Animal Science, University of Arkansas.*

Neotyphodium coenophialum is an endophytic fungus that synthesizes ergot alkaloids that result in toxicological conditions when ingested by animals. Dexamethasone (DXM) has been shown to induce enzymatic degradation of ergot alkaloids by liver microsomes. Many of the byproducts of those degradation events are oxidants. Our objective was to determine if DXM in combination with selenium and vitamin E (MuSe) could prevent the toxic effects of ergot alkaloids on calf gains and immune function. Fall born Angus-crossbred steers (n = 32; BW = 256 $\pm$ 28 kg) were assigned to one of four dry lot pens. Calves in two pens were fed ad libitum toxic K31 tall fescue baleage (K31+), and calves in two pens were fed ad libitum non-toxic tall fescue baleage (HiMag 4). Within each pen calves were assigned to a 2 X 2 factorial treatment structure. Main effects were DXM (0 vs. 0.04 mg/kg i.m. weekly) and selenium/vitamin E (MuSe; 0 vs. 15 mg Se and 150 mg vitamin E, i.m. monthly). On trial day 35, all calves were given an injection (i.p.) of lipopolysaccharide from *Salmonella typhimurium* (31.8 ug/45 kg BW). Pre-challenge ADG of steers was decreased (P < 0.001) by DXM administration (0.9 vs. 0.55 kg/d), and was affected (P = 0.09) by an interaction between forage and MuSe. Hematological indices (red blood cells, white blood cells, hemoglobin, and hematocrit) at 0, 7, and 24 h post-injection were generally affected by an interaction (P < 0.1) of forage and DXM. During the 13 d post-challenge, steer ADG was primarily negative and affected (P < 0.02) by an interaction of forage and DXM, and a three-way interaction (P = 0.07) of forage, DXM, and MuSe. Steers consuming HiMag 4 and treated with DXM and MuSe was greater (P < 0.01) than steers consuming K31+ and treated with DXM and MuSe (0.1 vs. -1.1 kg/d). Treating steers with DXM and MuSe did not improve weight gains or immune response while consuming tall fescue infected with toxic endophytic fungus.

Key Words: Cattle, Tall Fescue, Pharmaceuticals

8   The effect of fatty acids on the insulin response of L6 myoblasts. N. C. Burdick* and J. C. Laurenz, *Texas A&M University-Kingsville.*

Dietary fat can modify basal and insulin-stimulated glucose metabolism, and this effect may result from alterations in the fatty acid composition of cell membranes. This study utilized an *in vitro* system to assess the effects of saturated and polyunsaturated fatty acids on insulin-stimulated glucose uptake and incorporation into glycogen. L6 myoblasts were plated in 96-well plates in DME/F12 containing 10% fetal bovine serum and 2 mM L-glutamine. Cells were then grown to confluence and allowed to differentiate. The medium was then replaced with medium containing 0, 1, 10 or 100 μM of the saturated fatty acids (palmitic or stearic; PA and SA, respectively) or the polyunsaturated fatty acids (gamma-linolenic; conjugated linolenic, or docosahexanoic; GLA, CLA or DHA, respectively). Cultures were incubated for 48 h hours to allow incorporation of fatty acids. Insulin stimulation of glucose uptake and incorporation into glycogen was determined by aspirating the medium and replacing it with medium containing ^{14}C-glucose (10 μCi/mL) and insulin (0 to 10,000 nM). Cultures were incubated for 2 h, and ^{14}C incorporation determined using a liquid scintillation counter. As expected, insulin induced a dose-dependent increase (P < 0.01) in glucose incorporation into glycogen with maximal effects occurring 100 nM (2239 ± 152 vs. 6909 ± 699 DPM, for 0 and 100 nM insulin, respectively). For the saturated fatty acids PA inhibited (P < 0.01) glucose incorporation at both 10 and 100 μM, but was without effect (P > 0.05) at lower concentrations. In contrast, SA induced dose-dependent increases (P < 0.05) in glucose use at low insulin concentrations (< 100 nM), but was without effect (P > 0.05) at higher insulin concentrations. For the polyunsaturated fatty acids, high concentrations of the GLA, CLA and DHA (10 and 100 μM) inhibited (P < 0.05) insulin responsiveness. This did not appear to result from effects on cell viability, as basal glucose incorporation in these treatments were similar (P > 0.05) to cultures containing no fatty acid. These results suggest that the effect of dietary fat on insulin responsiveness may be reflective of changes in the fatty acid composition of cell membranes.

Key Words: Insulin, Fatty Acids

Graduate Student Competition

9   Supplementation with dietary fat compared to ryegrass grazing on carcass traits and reproductive efficiency in yearling beef heifers. A. R. Dos Santos*[1,2], S. T. Willard[1], and R. C. Vann[2], [1]*Department of Animal and Dairy Sciences, Mississippi State, MS,* [2]*Brown Loam Experiment Station.*

Feeding dietary fat has been used in feedlot operations to increase ADG, reduce ADFI and enhance carcass traits. Moreover, the onset of reproductive activity is linked with age, body weight and dietary energy intake in beef heifers. The objective of this study was to compare the feeding of dietary fat to ryegrass grazing on carcass traits and the overall pregnancy rate in yearling beef heifers. Heifers were assigned treatments as follows: soybean meal + Fuzzpellet[TM] cottonseed (SFZ; 5% fat; n=35); corn + extruded soybean meal (CES; 2.5% fat; n=35); and ryegrass pasture (RYP; n=35; no fat). Diets for SFZ and CES were isonitrogenous (CP 18%), and fed at 2.7 kg/hd/d for 84 d. Measurements of live animal carcass traits were taken at d 0, 28, 56 and 84 for ribeye area (REA), back fat (BF), rump fat (RF), gluteus medius depth (GMD) and percentage intramuscular fat (%IMF). Based on ultrasound analysis, IMF and GMD stress scores were also assigned . After d 84, estrus was synchronized (CIDR[TM]) and heifers bred AI. Change in REA, GMD, BF and RF were greater (P < 0.05) for RYP heifers than SFZ and CES heifers. GMD stress score was greater (P < 0.05) for CES heifers than RYP and SFZ heifers. In CES heifers, %IMF decreased and IMF stress score increased (P < 0.05), whereas SFZ and RYP heifers increased (P < 0.05) in %IMF with no change (P > 0.05) in IMF stress score. A greater proportion (P < 0.01) of heifers in the SFZ and CES groups were cycling (51.5 and 45.7%, respectively), based on estrus detection, than the RYP group (14.3%) prior to CIDR[TM] administration. However, pregnancy rates following AI for CES, RYP and SFZ heifers (74.29, 71.43 and 64.71%, respectively) did not differ (P > 0.10) among groups. In summary, feeding dietary fat compared to ryegrass pastures did not alter reproductive efficiency (i.e., overall pregnancy rates), however heifers on ryegrass pastures outperformed supplemented heifers in growth and carcass traits.

Key Words: Supplemental Fat, Carcass Traits, Reproduction

10   Effects of sericea lespedeza hay on goats infected with Haemonchus contortus. S. A. Shaik*[1], T. H. Terrill[1], B. Kouakou[1], G. Kannan[1], J. E. Miller[2], R. M. Kaplan[3], J. M. Burke[4], and J. A. Mosjidis[5], [1]*1Fort Valley State University,* [2]*Louisiana State University,* [3]*The University of Georgia,* [4]*USDA, ARS-DBSFRC,* [5]*Auburn University.*

Grazing forages containing condensed tannins (CT), or mixing extracted CT in feed supplement has shown potential for reducing fecal egg count (FEC) in sheep and goats. The anthelmintic potential of sericea lespedeza (Lespedeza cuneata) hay was evaluated in an 11-week feeding trial using twenty 4-month-old male Boer goats held in four pens (5 animals each). To boost a low level natural infection acquired on pasture, all goats were given a trickle infection with 500 Haemonchus contortus infective (L3) larvae four times over a two-week period prior to moving to pens. After 1-week pen adjustment, animals were randomly allocated to two control (bermudagrass hay) and two treatment (sericea hay) pens based upon FEC. All goats were given a small amount of supplement to balance diets for energy and protein. Both treatment and control goats

were fed the bermudagrass diet during weeks 1-5 (pre-trial period), after which animals in treatment pens were fed the sericea diet for weeks 6-11 (trial period). All goats were given a trickle infection three times a week during weeks 1-8. Blood packed cell volume (PCV) and FEC were recorded weekly. FEC was similar between treatment and control goats during the pre-trial period and significantly lower ($P < 0.05$) in sericea-fed animals throughout the 6-week trial period (avg. 79.7% reduction). In the pre-trial period, PCV was higher ($P < 0.05$) in control (27.2) than in treatment goats (24.3), but during the trial period, PCV was higher ($P < 0.05$) in the treatment than in the control group (23.1 vs. 19.7, respectively). Feeding sericea lespedeza hay to goats has potential to reduce effects of parasitic nematodes on animal health and to lower pasture contamination with parasitic larvae.

11 Efficacy of copper oxide wire particles against gastrointestinal nematodes of goats.

R. K. Kallu*[1], T. H. Terrill[1], and J. E. Miller[2], [1]*Fort Valley State University,* [2]*Louisiana State University.*

Infection with gastrointestinal nematodes (GIN) is the biggest constraint to profitable goat production in the southern United States. Overuse of anthelminthics has lead to widespread multiple drug resistance in goat GIN in this region. As an alternative to anthelmintics, an experiment was undertaken to study effect of copper oxide particles on naturally GIN-infected goats. Twenty-two Spanish does were assigned to two groups based upon GIN eggs per gram (EPG) of feces (n=11/treatment group) for a six-week grazing trial. Treated animals were given a bolus containing 4g of copper wire particles, whereas control animals were given an empty bolus. During each week of the study, feces and blood samples were taken from individual animals for determination of EPG and packed cell volume (PCV), respectively. Data were analyzed using repeated measures analysis. There was no treatment effect on PCV, but PCV for both groups declined (P<0.05) over time. There was a trend (P<0.07) for lower EPG in copper-treated goats after two weeks, and there was a treatment by time interaction for EPG (P<0.05) over the whole trial. Egg counts in copper-treated animals were lower than in untreated goats on 3 out of 4 sampling dates during the first 5 weeks post-treatment (432 versus 879 average EPG, respectively), but there was no difference in EPG at the 6-week sampling. Feeding copper oxide particles to GIN-infected goats has potential for reducing number of parasite eggs passed onto pasture. This strategy may be useful in a GIN control program for goats.

12 Effects of feeding *ascophyllum nodosum* supplementation in finishing cattle diets to improve overall quality grades.

M. Anderson*[1], J. W. Johnson[1], S. Kim[1], M. Miller[1], J. C. Brooks[1], J. Gleghorn[2], D. Woerner[1], Z. Vineyard[1], J. Byrd[1], W. Palmore[1], M. Jaks[1], M. Teague[1], and J. Blanton Jr.[1], [1]*Texas Tech University,* [2]*Nutrition Service Associates.*

English-cross steers (n=34) and heifers (n=34) were supplemented with *Ascophyllum nodosum* to evaluate its effects on beef quality grade. Cattle were randomly blocked by sex and divided into one control and three treatment groups. Control animals did not receive *Ascophyllum nodosum* supplementation, treatment 1 (trt1) received *Ascophyllum nodosum* supplementation from day 36-50 of the trial, trt 2 received *Ascophyllum nodosum* supplementation for the last 14 d of the trial, and trt 3 was supplemented with *Ascophyllum nodosum* on day 36-50 and last 14 d of the trial. *Ascophyllum nodosum* was supplemented to a dry rolled corn based diet containing 13.3% crude protein at 2% of the diet on a DM basis. Cattle were weighted and serial ultrasounded on day 0 and every 28 d following until they reach an average weight of 544.31 kg. At this time cattle were shipped 25 km for harvest at Excel Plainview, TX. Control group marbling score was highly correlated with ultrasound marbling score for the length of the trial with day 26 and day 119 having the highest correlations, r^2 = .9033 ($P < 0.05$), and r^2 = .9142 ($P < 0.05$) respectively. Treatment group ultrasound evaluations did not correlate at any period. No effect of *Ascophyllum nodosum* was found for measured performance characteristics. Control group had an ADG of 3.19 ($\pm$ .14); trt 1 had an ADG of 3.11 ($\pm$ .14); trt 2 had an ADG of 2.89 ($\pm$ .14) and trt 3 had an ADG of 3.35 ($\pm$ .14). All treatments groups supplemented with *Ascophyllum nodosum* had higher marbling scores ($P < 0.05$) than the control group. Control group had 25% Choice, 62.5% Select; trt 1 had 75% Choice, 18.8% Select; trt 2 had 62.5% Choice, 25% Select and trt 3 had 56.3% Choice and 31.2% Select. Overall, treatment groups had a 39.58 % increase in Choice quality grade and a 37.5 % decrease in Select quality grade when compared to the control group. Therefore, *Ascophyllum nodosum* supplemented at 2% on a DM basis to English-cross feedlot animals will result in an increase in beef quality grade without affecting other performance parameters.

13 No-till compared to reduced-till and conventional tillage systems for small-grain forages.

M. Bowman*, P. Beck, K. Lusby, S. Gunter, and D. Hubbell, *University of Arkansas.*

Farmers are under pressure to adopt systems that reduce the fuel and investment costs of equipment, are environmentally sustainable and reduce weather-related risks. This study compared no-tillage techniques to reduced tillage and conventional tillage for the production of small-grain forages for grazing stocker calves. These tillage techniques were defined as: 1) no-till seeding into undisturbed stubble, 2) reduced-till consisting of disking with a target of 50% soil surface residue followed by broadcast seeding, and 3) conventional-till, consisting of chisel plowing, heavy disking, and light disking during the summer. Pasture had been managed utilizing the same tillage methods the previous year. A mixture of wheat and rye was planted in the first week of September at a rate of 68kg each per ha. Forage availability of each pasture was determined using a calibrated disk meter. Initial stocking consisted of 90 steer calves (BW=208+-2.24 kg) grazed 88 days from 28 October to 23 January. A second group of 135 calves (BW=233+-2.54 kg) grazed 56 days from 2 March to 27 April. Fall and Spring ADG were analyzed using proc mixed in SAS, and gain/ha was analyzed using proc GLM of SAS. Fall ADG in no-till pastures were 0.17 kg/d greater than for reduced till and conventional-till pastures (P<0.05). ADG were not different among tillage treatments in the spring. Gain/ha tended to be greater for no-till than reduced-till (P=0.10) and conventional-till (P=0.08) (550, 501, and 479 kg respectively). Forage production was greater (P<0.05) in no-till pastures than for conventional-till pastures at the initiation of fall grazing (1,879 vs. 1,525 kg), the end of fall grazing (1,254 vs. 1,015 kg), and the initiation of spring grazing (1,170 vs. 856 kg). No-till pastures also had more (P<0.05) forage at the initiation of spring grazing than reduced-till pastures (1,170 vs. 913 kg). It appears that establishing wheat and rye using no-till is superior in the fall grazing period. Based on this data set, no-till methods of establishing small-grain forages to be grazed by stocker calves are as successful as reduced-till and conventional tillage practices.

14 Mutations in the NADH complex 1 gene sequence of tissues from Holstein bulls and their dams.

C. Stanley*, J. Chandler, A. Canal, C. Williams, A. Anderson, and D. Blouin, *LSU Agricultural Center.*

Mitochondrial gene mutations for NADH dehydrogenase - complex1 (ND1) could cause a "bottleneck" in energy production. Mitochondrial DNA (mtDNA) is inherited from the dam, thus a dam and son should have similar gene sequences and there may be similarities between tissues within an individual. Two ejaculates were collected and frozen from each of three unrelated Holsteins on two days. Two blood samples from each bull and their dams were collected on two days. Leukocytes (WBC), which had been used in literature comparisons, were separated and counted on a hemacytometer. The mtDNA was extracted, quantified and amplified by PCR in two segments. The PCR products were verified by electrophoresis, purified and sequenced. Individual sequence data were compared to the GenBank ND1 bovine sequence. Basepair triplets were translated into amino acids (AA). The AA mismatches (mutations) were scored "1" and AA matches scored "0" based on GenBank agreement. The binary data were analyzed using PROC GLM. The model effects were animal, sample within animal, sequence position, tissues and all of the two-way interactions (R-square = 0.57). The main and interaction effects were tested with appropriate error terms. Least squares means yielded the mutation frequency across sequence positions in the different tissues. A frame shift occurred in the second segment of one cow WBC sample. While mutations were found in some of the remaining samples, none of them had a frame shift; therefore data for eleven sequence positions in this one segment were excluded. A position by tissue interaction existed with the number (70) and frequency (0.32) of sperm mutations being different (P<0.01) from those in dam WBC

(7, 0.057). The dam WBC mutations were similar (P>0.05) to those in son WBC (10, 0.04). A sequence difference (P<0.01) between bull WBC and sperm implied that freezing increased mismatch frequency, but this cannot be determined. Future work should include the impact of cryopreservation on gene sequences and translation products.

Key Words: Mitochondrial Gene Sequence, Holstein, Dam and Son Comparison

15   Dexamethasone (DEX) and Insulin-like growth factor-1 (IGF-1) effects on pig macrophage nitric oxide production *in vitro*. L. A. Soliz*[1], T. H. Welsh, Jr.[2], and J. C. Laurenz[1], [1]*Texas A&M University-Kingsville,* [2]*Texas Agricultural Experiment Station-College Station.*

Previously we reported the ability of DEX to inhibit and IGF-1 to enhance lipopolysaccharide (LPS)-induced tumor necrosis factor-α (TNF-α) production by cultured pig macrophages. To assess whether these effects were unique to TNF-α, or represented a generalized effect on LPS-induced production of proinflammatory mediators, this study investigated the effects of DEX and IGF-1 on LPS-induced nitric oxide (NO) production by pig macrophages. Blood was obtained from male, crossbred pigs (120 d of age) and mononuclear cells obtained by density gradient centrifugation. Macrophages were obtained by plating cells in 24-well plates at a density of 6 x 10^7 cells/well in DME/F12 containing 10% fetal bovine serum, 2 mM L-glutamine, 50 u/mL penicillin/streptomycin, and 20 ng/mL macrophage-colony stimulating factor (complete medium) and incubating (37.5 C, 5% CO_2) for 24 h. The medium, containing non-adherent cells, was then aspirated and macrophages re-fed with complete medium. Cultures were maintained for 7 d and re-fed at 3 d intervals. Cultures were stimulated with complete medium containing LPS (0 to 10,000 ng/mL) in the presence of DEX (10^{-6} to 10^{-12}M) and/or IGF-1 (0 to 200 ng/mL). Supernatants were removed at 0, 3, 6, 12 and 24 h after stimulation and NO content of the supernatants determined using a commercially available kit (R&D Systems, Minneapolis, MN). LPS induced both dose- and time-dependent increases (P<0.001) in NO production with maximal effects occurring after 12 h of stimulation and an LPS dose of 10,000 ng/ml (6.1 $\pm$ 0.4 vs. 24.6 $\pm$ 0.9 μmol/L for the 0 vs. 10,000 ng/mL LPS at 12 h, respectively). In contrast to its ability to inhibit TNF-α production, DEX did not effect (P > 0.05) LPS-induced NO production by pig macrophages. Similarly, IGF-1 did not influence (P > 0.05) LPS-induced NO at any of the doses employed. These results indicate that neither DEX nor IGF-1 effect LPS-induced NO production. Furthermore, in combination with our previous results, these results suggest that DEX and IGF-1 modulate specific components of the proinflammatory response.

Key Words: Proinflammatory, Glucocorticoids

Breeding and Genetics

16   Different measures of energetic efficiency, ultrasound and carcass merit and their relationships with mitochondrial activity in Angus cattle. B. A. Sandelin*[1], A. H. Brown, Jr.[1], C. Ojano-Dirain[1], M. Iqbal[1], W. G. Bottje[1], M. A. Brown[2], W. O. Herring[3], M. Akin[4], Z. B. Johnson[1], and R. T. Baublits[1], [1]*University of Arkansas,* [2]*USDA-ARS Grazinglands Research Laboratory ,* [3]*Smithfield Premium Genetics Group,* [4]*Circle A Angus Ranch.*

The objectives of this study were to determine the relationships between different measures of energetic efficiency and ultrasound and actual carcass data with respiratory chain complex activity. Feed efficiency was determined on 92 contemporary purebred Angus steers fed over a 130 d period at Circle A Angus Ranch, Iberia, MO. Individual animal intake was measured by a Calan Broadbent Feeding system. Animals were fed five finishing rations (stepwise) throughout the feeding period. Residual feed intake was calculated by regressing intake on growth rate and average body weight. Ultrasound carcass measurements were taken prior to slaughter. Animals were harvested at a commercial packing plant and muscle (Sternohyoideus) samples were obtained for biochemical analysis. Actual carcass data were obtained 24h post-mortem. Muscle homogenate and mitochondria were isolated using differential centrifugation. Activities of respiratory chain complexes were measured using spectrophotometric methods. Correlation coefficients of all data were computed using PROC CORR procedure of SAS. Complex I activity was highly (P < 0.005) correlated with feed/gain, gain/feed and residual feed intake, (0.71, -0.72, and 0.55, respectively). Complex II activity was also highly correlated with feed/gain, gain/feed, and residual feed intake (0.58, -0.61, and 0.53, respectively). Average daily gain was negatively correlated with both Complex I (P < 0.01) and Complex II (P < 0.08) activity (-0.64 and -0.47 respectively). No significant relationships were found between mitochondrial activities and ultrasound or actual carcass measurements. It appears that there is a significant relationship between mitochondrial respiratory chain complex activities and measures of efficiency in cattle that warrant further investigation.

Key Words: Feed Efficiency, Angus, Muscle Mitochondria

17   Success at first insemination in Australian Angus cattle: analysis of uncertain binary responses. M. Spangler*, R. Sapp, R. Rekaya, and J. Bertrand, *University of Georgia.*

Field data consisting of 33,099 records from Australian Angus herds were used to investigate two methods of analyzing uncertain binary responses for success or failure at first insemination. A linear mixed model that included herd, year, and month of mating as fixed effects; unrelated service sire, additive animal and residual as random effects; and linear and quadratic effects of age at mating as covariates was used to analyze binary data. An average gestation length (GL) derived from artificial insemination (AI) data was used to assign an insemination date to females. Females deviating from average GL leads to uncertain binary responses. Two analyses were carried out: 1) a threshold model fitted to uncertain binary data ignoring uncertainty (M1), and 2) a threshold model fitted to uncertain binary data accounting for uncertainty via fuzzy logic classification (M2). There was practically no difference between point estimates obtained from M1 and M2 for service sire and herd variances. However, the estimates of heritability from M1 and M2 were 0.042 and 0.024, respectively, indicating a difference in the additive variance estimates derived from these two methods. Pearson correlations indicated no major re-ranking would be expected for service sire effects (0.99) and animal breeding values (0.98) using M1 and M2. Given the results of the current study, for noisy binary data, a threshold model contemplating uncertainty is suggested to avoid bias when estimating genetic parameters.

Key Words: Beef Cattle, Binary Data, Fuzzy Logic

18   Simulation of first insemination success in beef cattle: Analysis of uncertain binary responses using fuzzy logic classification. R. L. Sapp*, M. L. Spangler, R. Rekaya, and J. K. Bertrand, *The University of Georgia.*

A simulation was carried out to investigate two methods of analyzing uncertain binary responses for success or failure at first insemination. A linear mixed model that included herd, year, and month of mating as fixed effects; and unrelated service sire, sire and residual as random effects were used to generate binary data. Binary responses were assigned using the difference between days to calving (DC) and average gestation length (GL). If the difference between DC and average GL was less than or equal to 21 days then first insemination success (FIS) = 1, otherwise FIS = 0; in other words, a successful FIS event was defined as conception during the first 21 days of the breeding season. Females deviating from average GL leads to uncertain binary responses. It was assumed that if the absolute value of the deviation of average GL from DC and 21 was greater than one standard deviation (5 d) of GL, then the observed FIS response was certain. Three analyses were carried out: 1) threshold model (TM) fitted to true binary data, 2) TM fitted to uncertain binary data ignoring uncertainty (M2), and 3) TM fitted to uncertain binary data accounting for uncertainty via fuzzy logic classification (M3). There was virtually no difference between point estimates obtained from M3 and true values. When uncertain binary data were analyzed with a standard TM with no consideration for misclassification (M2), sire variance and heritability was under estimated by 22% and 24%, respectively. Pearson correlations between true and predicted sire breeding values (estimated service sire effects) were 0.45 and 0.46

(0.58 and 0.58) using M2 and M3, respectively. The Pearson correlations suggested that predicted breeding values of sires were more affected by the analysis method than the estimated service sire effects. The results of this study suggest that when analyzing binary data with uncertainty, a standard TM could lead to biased inferences. This problem could be avoided by a statistical model that contemplates uncertainty such as the method proposed using fuzzy logic classification.

Key Words: Beef Cattle, Fertility, Fuzzy Logic

19 Effects of climatic and phototrophic conditions prior to feeding on feed intake of beef bulls during post-weaning feedlot performance tests. G. T. Tabler*[1], A. H. Brown, Jr.[1], E. E. Gbur[2], I. L. Berry[3], Z. B. Johnson[1], D. W. Kellogg[1], and K. C. Thompson[2], [1]*University if Arkansas Department of Animal Science,* [2]*University of Arkansas Agricultural Statistics Lab,* [3]*University of Arkansas Department of Biological and Agricultural Engineering.*

Climatic and phototrophic conditions prior to feeding were analyzed to identify and quantify effects on feed intake of performance-tested beef bulls. Feed intake data originated from bulls (n = 1,874) in University of Arkansas Cooperative Bull Tests at Fayetteville, Hope and Monticello during 52 trials from 1978 to 1990. Bulls were given a 21-d adjustment period then individually full-fed a total mixed ration twice daily (0800 to 1000 and 1500 to 1700) in the same stall for 140 d. Diet contained 1.6 Mcal NEm, 0.9 Mcal NEg and 12% CP per kg DM. Initial weight and age were recorded at start of each test with weights taken at 28-d intervals. Photoperiod and climate data were obtained from U.S. Naval Observatory (Washington, DC) and National Climatic Data Center (Asheville, NC), respectively. Variables included maximum and minimum temperature, rainfall, day length, and the following variables from 0400 to 0800 and from 1100 to 1500: temperature, dew point temperature, barometric pressure, relative humidity, and wind speed. Data were pooled, divided into five 28-d periods with each period analyzed separately using all animals over all tests. Initial age and weight were included in principal components (PC) regression as independent variables to adjust for initial animal differences. Feed intake was influenced (P < 0.001) by seven to 11 PCs representing initial weight, initial age, and numerous climatic variables throughout the study. The R-squares for feeding periods one through five were 0.43, 0.53, 0.50, 0.43, and 0.36, respectively. Results indicate that climate conditions prior to feeding influence feed intake of feedlot cattle throughout a feeding period. Effects of individual climatic and phototrophic components on intake may vary as a feeding period progresses.

Key Words: Beef Cattle, Feed Intake, Climate

20 Effects of climate and photoperiod on feed intake of beef bulls during feedlot performance tests. G. T. Tabler*[1], A. H. Brown, Jr.[1], E. E. Gbur[2], I. L. Berry[3], Z. B. Johnson[1], K. C. Thompson[2], and D. W. Kellogg[1], [1]*University of Arkansas Department of Animal Science,* [2]*University of Arkansas Agricultural Statistics Lab,* [3]*University of Arkansas Department of Biological and Agricultural Engineering.*

Climate and photoperiod data were analyzed to identify and quantify impacts on feed intake of beef bulls during 52 feedlot performance tests. Feed intake data originated from bulls (n =1,874) in University of Arkansas Cooperative Bull Tests at Fayetteville, Hope and Monticello from 1978 to 1990. Bulls were given a 21-d adjustment period, then individually full-fed a total mixed ration twice daily in the same stall for 140 d. Diet contained 1.6 Mcal NEm, 0.9 Mcal NEg and 12% CP per kg DM. Initial age and weight were recorded at start of each test with weights taken at 28-d intervals thereafter. Photoperiod and climate data were obtained from U.S. Naval Observatory (Washington, DC) and National Climatic Data Center (Asheville, NC), respectively. Variables included maximum, minimum, average, and dew point temperatures, relative humidity, barometric pressure, rainfall, day length and wind speed. Data were pooled, divided into five 28-d periods, with each period analyzed separately using all animals over all tests. Principal component (PC) analysis was appropriate due to collinearity among numerous climatic variables. Initial age and weight were included in principal components regression as independent variables to adjust for initial animal differences. Feed intake throughout the study period was influenced (P < 0.001) by seven to nine PCs representing initial weight,

initial age and numerous climate factors. The R-squares for feeding periods one through five were 0.43, 0.54, 0.51, 0.45 and 0.34, respectively. Results indicate that numerous climatic variables influence feed intake throughout a feeding period and temperature alone is inadequate to represent the impacts of weather on feed intake of beef cattle. Photoperiod and climate may each have differing effects on intake as feeding periods progress.

Key Words: Beef Cattle, Climate, Feed Intake

21 Relationships between performance test traits and age at first farrowing in four breeds of swine. Z. Johnson*[1], J. Chewning[1], and R. Nugent, III[2], [1]*University of Arkansas,* [2]*The Pork Group, Tyson Foods, Inc.*

The objective of this study was to examine relationships between performance test traits and age at first farrowing (AFF) in populations of Landrace, Yorkshire, Duroc and Hampshire swine. Performance test records were collected in a commercial swine operation from 1992 to 1999. All females were grown to 100 d of age (AGE100; n = 8,611, 38,553, 7,024, and 4,880 for Landrace, Yorkshire, Duroc and Hampshire herds, respectively). At this time pigs were weighed (WT100) and selected for performance testing based on a combination of maternal and performance indexes which were different for each breed. Pigs were weighed at the end of the 77-d performance test (WT177) and ADG calculated. Backfat (BF) and loin eye area (LEA) were measured at the 12th rib using B-mode ultrasound equipment. Body length (LEN) was measured. Age of dam at the birth of first litter was calculated. Averages were 335 ± 1.0 d for Landrace, 334 ± 0.5 d for Yorkshire, 334 ± 1.0 d for Duroc, and 335 ± 1.5 d for Hampshire. Heritabilities and genetic correlations were estimated using a series of two-trait animal models with litter effects and multiple-trait DFREML procedures. Fixed effects for performance traits included contemporary group and either age at 100 d or 177 d as a covariate. Contemporary group and litter size were fixed effects for AFF. Estimates of heritability for AFF were 0.06 ± 0.05, 0.10 ± 0.03, 0.19 ± 0.07, and 0.07 ± 0.08 for Landrace, Yorkshire, Duroc and Hampshire, respectively. Genetic correlations for AFF with WT100, WT177, ADG, LEN, BF, and LEA were, respectively, 0.22, 0.24, 0.08, 0.27, -0.06, and 0.15 for Landrace; 0.16, -0.19, -0.25, -0.04, -0.36, and 0.05 for Yorkshire; 0.52, 0.05, -0.19, -0.08, 0.04, and 0.09 for Duroc; and 0.46, -0.16, -0.47, -0.18, -0.03, and -0.17 for Hampshire. Correlations indicated that relationships do exist between performance test traits and subsequent age at farrowing; although these may differ by breed and population. Breeders may want to take these associations into consideration in selection programs.

Key Words: Pigs, Performance, Age At First Farrowing

22 Estimation of (co) variance components due to genetic competition effects in pigs. J. P. Cassady*[1] and L. D. Van Vleck[2], [1]*North Carolina State University,* [2]*USDA-ARS, Roman L. Hruska U.S. Meat Animal Research Center.*

The objective of this project was to estimate (co) variance components for direct and competition genetic effects in pigs. Efforts have been made to modify facilities and production practices to create a better environment for pigs. However, little consideration has been given to pig behavior. If heritable measures of pig behavior can be identified, pig behavior might be modified genetically to improve both pig well being and producer profitability. Muir and Schinckel proposed a model containing genetic competition effects. A hypothesis is that pigs, which grow faster than their pen mates, do so at the expense of their pen mates performance. If this hypothesis were true, an unfavorable correlation would be expected between direct and competition effects. Pigs (n = 840) were from a 4-breed composite population (Duroc, Hampshire, Large White, and Landrace). Pigs were penned in groups of eight by sex. Area of each pen was 7.4 m2. A restriction was that full-sibs were not penned together. Traits recorded were on test weight, ADG, days to 105 kg (DAYS), and backfat adjusted to 105 kg (ABF). Analyses were with a version of the MTDFREML program modified to allow for a vector of second animal genetic effects. Pen mates were considered to be competitors and were entered as second animal effects. Thus, each pig had effects of seven competitors included in its record. Fixed effects were sex (n = 2), pen (n = 111), and year (n = 2). Estimates of heritabilities of direct effects were 0.39, 0.35, and 0.20 and estimates of heritabilities of competition effects were 0.06, 0.29, and 0.39 for DAYS, ADG, and

ABF, respectively. Correlations between direct and competition effects for DAYS, ADG, and ABF were -0.20, 0.92, and 1.0, respectively. Estimates of heritability of direct effects for DAYS, ADG, and ABF were within the range commonly reported in scientific literature. Competition effects were favorably correlated with direct effects. Thus, selection on direct effects would not be expected to result in unfavorable competition among pen mates. Competition effects are heritable and may be useful for improving accuracy of selection for growth and backfat in pigs.

Key Words: Competition Effects, Genetics, Pig

23   A study of parasite challenge in goats. J. M. Dzakuma*[1], L. C. Nuti[1], B. M. Johnson[1], N. C. Beckford[1], S. E. Kom[1], P. L. Diamond[2], and T. M. Craig[2], [1]*Prairie View A&M University,* [2]*Texas A&M University.*

Sixty pasture raised Tennessee stiff-legged (TS), Spanish (SP), and Boer (BR) kids born in spring 2003 were each challenged in fall 2003 with a single dose of 1,000 infective larvae/4.5 kg body weight. Body weights, total protein (TP), packed cell volume (PCV) and fecal egg counts (FEC) were each analyzed using SAS GLM repeated measures analysis of variance. The model included breed, sex and their interaction. Time of measurement (days post-challenge (pc), i.e., 0, 7, 34 and 49 d) was included as the repeated factor and contrasted with measures on day

0. Seven days pc weight did not differ ($P > 0.4$) for breeds, however, day 34 and 49 weights pc differed ($P < 0.004$) and ($P < 0.001$), respectively. Analysis of change in weight corresponding to day 0 through day 49 showed BR gaining 7.3 kg compared to SP gaining 5.5 kg and TS gaining 4.1 kg ($P < 0.001$). These weight changes agree with the normal growth patterns in our PVAMU goat flock, without artificial challenge. Values of TP did not show any statistically significant differences for breeds nor sex at any time pc. Values of PCV differed at day 7 for breed ($P < 0.03$), sex ($P < 0.02$) and breed x sex ($P < 0.01$), however, no statistically significant differences were observed at day 34 nor 49. Comparison of PCV least squares means for breed effects, BR *vs* SP were 27.7 *vs* 30.7 ($P < 0.03$) and BR *vs* TS were 27.7 *vs* 31.9 kg ($P < 0.01$). Least squares means between SP and TS were not statistically significant. This result may imply that the Landrace breeds (TS and SP) may have some degree of tolerance to endoparasites. Results on FEC were negligible though they were transformed to natural logarithm (as $\ln(FEC+25)$) to accommodate FEC of zero. Another group of 50 kids were challenged in a second wave. Similar results were obtained. The question that arises from this study is: Were the infective larvae used for the challenge (1,000/4.5 kg body weight) adequate to realize meaningful results? This study is preliminary to a much larger study to select goats for resistance/tolerance to intestinal nematodes. In this study the effect of feed was overlooked. In future studies goats will be kept on a maintenance ration during the challenge.

Key Words: Tennessee Stiff-Legged, Spanish, Boer

Pastures and Forages

24   Evaluation of two digestibility markers for cattle consuming wheat pasture or alfalfa hay based diets. L. Appeddu*[1], K. Sweeney[1], J. Su[1], K. Mediano[1], and M. Brown[2], [1]*Southwestern Oklahoma State University,* [2]*USDA-ARS Grazinglands Research Laboratory.*

Negligible weight gain in stocker cattle after first being placed on winter wheat pasture suggests cattle undergo an adaptation period. Being a novel forage, the ability to digest wheat may be one factor involved in this adaptation. The objective of this research was to evaluate the use of two markers, acid detergent insoluble ash (ADIA) and indigestible acid detergent fiber (iADF), for estimating organic matter (OM) digestibility in cattle consuming an alfalfa hay-based diet (ALFALFA) or cattle placed on wheat pasture (WHEAT) over an initial five week period. A subset of feces collected from cattle in Fall 2002 (n = 69) and Spring 2003 (n = 45) were analyzed for percentages of iADF, ADIA, and OM. Percentage OM digestibility was calculated as follows: 100 - [100 * (%marker in feed ÷ %marker in feces) * (fecal OM% ÷ feed OM%)]. *In vitro* estimates of OM digestibility were made via 48 h incubation of feed samples in rumen fluid using Ankom technology.

In Fall 2002, data were inconclusive whether ADIA or iADF reliably estimated OM digestibility in DRYLOT cattle. After week 1 in Fall 2002, OM digestibilities for WHEAT cattle were higher (P #8804 0.001) for ADIA vs iADF. Although greater variation was observed for ADIA in Fall 2002, estimates of OM digestibilities for WHEAT and DRYLOT were closer to *in vitro* values when using ADIA vs iADF. In Spring 2003, OM digestibility of WHEAT was higher ($P = 0.02$) when using ADIA vs iADF (95.7 ± 0.32% vs 94.1 ± 0.23%). No difference (P #8805 0.44) was found in DRYLOT OM digestibility when using ADIA vs iADF (86.5 ± 1.16% vs 88.3 ± 2.35%). This result may be attributed to all cattle being placed on wheat after week 1 in spring 2003, as well as cattle being older. On average, cattle consuming WHEAT had a higher digestibility than DRYLOT cattle in Fall 2002 and Spring 2003. Results were inconclusive as to which marker was more reliable when estimating OM digestibility for newly weaned cattle in the fall and for alfalfa hay-based diets. Either marker appeared acceptable for estimating OM digestibility of spring wheat pasture.

Key Words: Wheat, Alfalfa, Digestibility

25   Remote sensing of crude protein in bermudagrass pastures during the summer grazing season. P. J. Starks*[1], W. A. Phillips[1], and S. W. Coleman[2], [1]*USDA-ARS Grazinglands Res. Lab,* [2]*USDA-ARS Subtropical Ag. Res. Sta.*

Livestock producers need tools to predict diet quality of free-ranging animals to develop supplementation strategies and to predict animal performance on warm season grass pastures. Current laboratory methods generally require sample collection, processing time of days to weeks, and may involve hazardous chemical wastes. The objective of this experiment was to compare real-time, remote sensing-based assessments of crude protein (CP) concentration of live, standing forage with conventional laboratory methods. Beginning on June 1, 2003 canopy reflectances from four 1.6-ha bermudagrass pastures were measured each week throughout the growing period and converted into estimates of CP concentration. These estimates were compared to CP concentrations determined by combustion nitrogen analysis of clipped, dried and ground forage samples of the area viewed by the remote sensing device. Repeated measures analysis indicated that there was no difference between CP determination methods ($P > 0.47$). Early in the growing season average CP concentration varied from 8% to 10%, depending upon pasture, declining to about 5% in all pastures at the end of the study. The remote sensing method provides rapid assessment of forage quality compared to conventional laboratory methods, which would allow producers to recognize dietary nutrient deficiencies in a more timely manner.

Key Words: Forage Quality, Remote Sensing, Assessment

26   Influence of crude protein concentration in bermudagrass hay on organic matter digestibility. M. S. Gadberry*, T. R. Troxel, J. A. Jennings, and G. V. Davis, *University of Arkansas, Cooperative Extension Service.*

The objective of this project was to evaluate the effect of CP concentration in bermudagrass hays on its in vitro OM digestibility (IVOMD; ash-free basis) and digestible OM. Fifty-seven bermudagrass hay samples were sifted from a sample bank of 280; a database containing sample DM, CP, ADF, and NDF concentration (DM basis) was used to identify the samples. Samples were selected based on the criteria of similar levels of NDF and ADF but containing either low (<10%), moderate (10 to 14.9%), or high (>14.9%) CP. Samples were analyzed in triplicate for OM and 48-h IVOMD. The CP concentration differed ($P < 0.001$) among the low, moderate, and high CP groups and averaged 8.2 ± 0.4, 12.0 ± 0.3 and 16.5 ± 0.3%, respectively. Neutral detergent fiber did

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not differ among groups and averaged 68.5 ± 0.6%; however, ADF differed ($P < 0.05$) among the low (33.3 ± 0.6%) and high (31.9 ± 0.4%) group, and the moderate group was intermediate (32.3 ± 0.5%). In vitro OM digestibility differed ($P < 0.05$) between the low (54.0 ± 1.7%) and high (58.9 ± 1.2%) group, and the moderate group was intermediate (57.3 ± 0.3%). Analysis of CP group on IVOMD using ADF as a covariate resulted in a non-significant effect of CP on IVOMD. Digestible OM was similar ($P > 0.10$) among groups (50.3 ± 1.5, 52.9 ± 1.1, and 53.7 ± 1.1% for low, moderate, and high CP, respectively). Difference in predicted TDN using the current Arkansas equation (111.8 + 0.95CP - 0.36ADF - 0.72NDF) and DOM suggested TDN was overestimated by 9.5 ± 1.3, 10.3 ± 1.0, and 14.3 ± 0.9 percentage units, respectively, and the difference was greater ($P < 0.05$) for the high CP group as compared to the lower CP groups. In conclusion, increased CP concentration of bermudagrass hay may not directly improve its digestible OM concentration; this fact may lead to erroneous TDN predictions when empirical equations include CP concentration as an independent variable.

Key Words: Protein, Bermudagrass, Digestion

27 *In situ* **degradation of native legumes and alfalfa in goats and cattle.** J. Foster*[1], J. Muir[1], B. Lambert[1,2], and D. Pawelek[1], [1]*Texas Agricultural Experiment Station,* [2]*Department of Animal Sciences, Tarleton State University.*

The objective of this study was to evaluate the *in situ* degradation rates of herbaceous native legumes when incubated in ruminally-fistulated goats or cattle fed a basal diet of sorghum-sudan hay (62.5±7.4% NDF, 1.17±0.7% N). *Desmanthus velutinus* (DV; 39.1±1.9% NDF, 2.8±0.2% N), *Acacia angustissima* (AA; 32.3±3.3% NDF, 2.9±0.7% N), *Neptunia pubescens* (NP; 36.4±4.0% NDF, 2.6±0.2% N) and *Medicago sativa* (ALF; 47.7±1.0% NDF, 2.9±0.6% N) were dried at 55°C for 48 h, and ground to 1 mm particle size. Samples were incubated *in situ* for 0, 4, 8, 16, 24, 48, and 96 hr. There was no interaction ($P>0.10$) between animal species and forage for DM or OM degradation. Lag time before degradation was 63% greater ($P=0.02$) for goats than for steers. Animal and forage species interaction ($P=0.005$) was observed for the N fraction slowly degraded in the rumen and total utilized fraction of N degradation. The same interaction ($P=0.12$) only tended to occur for the soluble fraction of N degradation or rate of degradation. Wash loss, which correlates with the soluble fraction, was greatest ($P=0.03$) for AA (38.6±1.06 %), moderate for NP and ALF (35.0±0.86 and 35.5±0.87 %, respectively), and least for DV (29.9±1.4 %). The fraction degraded slowly in the rumen was greater for DV, AA, and ALF (56.7±5.0, 49.6±3.5, and 42.9±2.9 % respectively) than for NP (38.1±2.9 %). NP contained the most ($P=0.05$) total potentially degraded DM (73.2±3.1 %), but ALF DM and OM were degraded 7 times faster ($P<0.02$; 0.07±0.003 g kg^{-1} hr^{-1}) than NP. The soluble OM fractions of AA, NP, and ALF (37.3±1.2, 34.2±1.2, 32.2±0.9 %) were greater ($P=0.006$) than that of DV (26.1± 1.5 %). The soluble fraction for N degradation was greatest ($P<0.007$) for ALF (36.7±2.7 %). The highest quality legume analyzed *in situ* was ALF; among the native legumes AA and NP contained a greater amount of soluble and slowly degraded DM and OM fractions than DV indicating that they are higher quality leguminous forages under these experimental conditions.

Key Words: Warm-Season Legumes, Forage Degradation, *In Situ*

28 **Nutritional quality evaluation of forage from bahiagrass selections.** R. Myer*[1], S. Coleman[2], J. Carter[1], A. Blount[1], and R. Littell[1], [1]*University of Florida,* [2]*USDA-ARS,STARS.*

Forage nutritional quality was evaluated from four selection cycles (C) of 'Pensacola' derived bahiagrass (Paspalum notatum Flugge). These selection cycles were developed from a restricted, recurrent phenotypic selection (RRPS) procedure used since 1960 by Dr. G. W. Burton, University of GA, CPES, Tifton, GA. This selection method resulted in increased forage yield; however, its impact on forage nutritional quality is not known. Forage samples were obtained from individual plant selections within each of four RRPS cycles (from oldest to most recent) which were CO ('Pensacola'), C4, C9 ('Tifton 9'), and C23. Forage from year-old plants (n = 175/cycle) was harvested by hand on Oct. 3, 2000 and again on Nov. 15, 2000. Samples were dried (49 C), ground (2 mm), and analyzed for DM, IVOMD, NDF and CP using near-infrared spectrophotometry (NIR). The NIR was calibrated from reference values on 275 samples selected based on spectral characteristics. Selection cycle

means ± 1 SD (%; DM basis) for CO, C4, C9 and C23, respectively for IVOMD were 49.7 ± 2.7, 50.3 ± 2.7, 52.8 ± 2.8 and 52.0 ± 2.9; for NDF, 81.0 ± 2.6, 79.7 ± 2.3, 78.7 ± 2.6 and 78.5 ± 2.8; and for CP, 14.2 ± 2.5, 13.7 ± 2.3, 13.2 ± 2.7 and 12.9 ± 2.2. The SE's were 0.10, 0.10 and 0.09 for IVOMD, NDF and CP, respectively. The higher mean IVOMD of C4 vs CO was significant (P<0.01), and C9 and C23 vs C4 (P<0.01). The results observed overall were also noted within each harvest date. Therefore, in addition to the previously reported increase in forage yield, there was evidence that forage nutritional quality also increased with advancing selection cycle.

Key Words: Forage, Forage Quality, Paspalum notatum

29 **Aerobic stability of wheat and orchardgrass balage during winter months.** R. Rhein, W. Coblentz*, J. Turner, C. Rosenkrans, R. Ogden, and D. Kellogg, *University of Arkansas Division of Agriculture.*

Using recently developed technology, balage is often stored in large (1.2 x 1.2-m) round bales that are wrapped in plastic film with an in-line wrapper. The aerobic stability of this fermented forage is important, particularly during winter months when it is fed to livestock or sold as a cash crop. Two types of forage, orchardgrass (*Dactylis glomerata* L.; 54.4% DM) and wheat (*Triticum aestivum* L.; 62.4% DM), were packaged in large-round bales and wrapped with an in-line wrapper during May 2002. Twenty-one bales of each balage type were unwrapped and exposed to air on 10 Dec. 2002 for 0, 2, 4, 8, 16, 24, or 32 d to evaluate aerobic stability. For both orchardgrass and wheat balage, final bale weight, concentration of DM, and pH were not affected (P #8805 0.10) by exposure time. Across both balage types, DM recoveries were > 97% for all bales, indicating that both types of balage were very stable when exposed to air. For orchardgrass balage, exposure time had no effect (P #8805 0.10) on concentrations of NDF, ADF, hemicellulose, cellulose, or lignin, thereby indicating that little deterioration occurred. Similarly, no contrast relating any fiber component with exposure time was significant (P #8805 0.10) for wheat balage. Exposure time had no effect on 48-h in situ digestibility of DM for wheat balage, but there was a tendency (P = 0.062) for a linear increase with exposure time for orchardgrass balage. However, the overall range (78.2 to 80.5%) over the 32-d exposure period was very narrow, and this response is probably of limited biological significance. Generally, concentrations of fermentation acids were low, primarily due to the high concentration of DM within these balages, and only minimal changes in these acids were observed over the exposure interval. These results suggest that the balage evaluated in this trial during winter conditions was very stable after exposure to air for up to 32 d. This should allow for considerable flexibility with respect to feeding, transport, and marketing of balage during winter months, without significant aerobic deterioration.

Key Words: Aerobic Stability, Balage, Orchardgrass

30 **Interseeding small grains and(or) annual ryegrass into bermudagrass sod for growing cattle.** P. A. Beck*, S. A. Gunter, C. B. Stewart, and J. M. Phillips, *University of Arkansas, SW Research & Extension Center.*

Annual ryegrass (RG) was interseeded into a bermudagrass sod alone or in combination with small grains (SG) to evaluate the effect of species on the growth of stocker calves. Stands were established in closely grazed bermudagrass sod using a no-till drill between 21 and 23 October 2002. The 20 0.81-ha pastures were seeded to Marshall RG alone (22 kg/ha) or RG plus 134 kg/ha of one of the following small grains; Bob oats (O), Wintergrazer 70 rye (R), VNS wheat (W), or 2700 triticale (T). Grazing was initiated when adequate forage was accumulated to support three steers (BW = 261 ± 2.4 kg) per pasture (1.68 calves/ha) on 23 December for SG pastures and 21 January or 16 February for RG pastures. Grazing was managed using the put-and-take method, where three calves were used as tester animals to measure performance, additional calves were added as needed to maintain equal grazing pressure among pastures. The pastures were fertilized with 336 kg of 17-17-17 on 4 November and 168 kg of ammonium nitrate in the spring on 16 January and 1 March. The steers were fed 0.91 kg/d of an energy supplement supplying required minerals and vitamins. Data were analyzed as a completely random design using the GLM procedure of SAS. Least-square means were separated using predicted differences to determine the effect of SG addition to the RG. There were no differences ($P >$

0.30) in ADG during the winter or spring grazing periods or over the entire trial (ADG = 0.78 kg). The addition of SG to RG increased ($P < 0.01$) the number of animal grazing-d/ha by an average of 244. Steers grazed R 122-d/ha more than T, while W and O were not different from either R or T. Gain/ha was highest ($P < 0.05$) for R (545 kg). Pastures planted to W and O tended ($P < 0.10$) to produce more gain/ha than RG alone or T (439 and 436 vs 353 or 339 kg, respectively). Planting T in addition to RG did not affect gain/ha ($P = 0.77$). In conclusion, the addition of SG to RG when interseeding into warm-season grass sod increases grazing-d/ha and R produced superior animal production/ha compared to other SG and RG alone.

Key Words: Small Grains, Beef Cattle, Forages

31 Timing of herbage allocation 1. Effect on beef heifers daily grazing pattern. P. Gregorini*[1,2], M. Eirin[1], R. Refi[1], M. Ursino[1], and O. Ansin[1], [1]*FCAyF, Universidad Nacional de La Plata*, [2]*Animal Science Department, University of Arkansas*.

The timing of grazing events (GE) determines how ruminants allot grazing to meet nutritional needs. Photosynthesis and respiration increases herbage DM and soluble carbohydrates concentrations daily. This change in composition may facilitate longer and intense GE at dusk. Thus, linking the grazing pattern (GP) and the plant phenology with the time of herbage allocation (HA) emerges as an option to manipulate length and intensity of the GE. This work analyzed the GP of beef heifers, by measuring daily grazing (DGT), rumination (DRT), idling (DIT) time, bite rate (BR), and their patterns when HA was allotted in the morning (0700; MHA) or afternoon (1500; AHA). This experiment occurred in July 2004 at the UNLP. Eight heifers grazed annual ryegrass pastures using strip grazing in a crossover design. The DGT, DRT, and DIT activities were recorded every 2 min, from 0600 to 1900 and were summarized into 3 intervals; morning, afternoon and evening. Bite rate was estimated in each GE. Dependent variables were tested by ANOVA and BR was analyzed as repeated measured in time. The AHA increased DIT and decreased DGT, concentrating DGT in the evening. In the evening BR was higher at AHA. The DRT varied by time, but total DRT did not. With AHA, DRT and DIT was longer morning and afternoon. The time of HA alters the GP; AHA generates longer and more intense GE when herbage should be higher quality.

Item/treatment	PM				AM			
	DGT	DRT	DIT	BR bites/ min	DGT	DRT	DIT	BR bites/ min
Morning[a]	26[b]	17[b]	54[b]	28[b]	38[d]	26[b]	31[e]	40[d]
Afternoon[a]	20[b]	80[e]	34[b]	33[b]	25[e]	58[d]	35[e]	38[d]
Evening[a]	54[e]	3[d]	12[c]	44[e]	35[d]	16[c]	35[e]	41[d]
Daily times, min	293[a]	71[a]	224[a]		363[b]	75[a]	191[b]	

[a]Percentage of daily time. b-e means in the same rows or columns with different superscripts differ (p < 0.001).

Key Words: Timing, Herbage Allocation, Grazing Pattern

32 Timing of herbage allocation 2. Effect on beef heifers weight gain, body condition score and daily herbage intake. P. Gregorini*[1,2], M. Eirin[1], R. Refi[1], M. Ursino[1], and O. Ansin[1], [1]*FCAyF, Universidad Nacional de La Plata* , [2]*Animal Science Department, University of Arkansas*.

The longer and most intensive meal of grazing ruminants occurs at dusk when herbage has an increased DM and soluble carbohydrates concentration. Thus, linking the daily grazing pattern, plant's phenology, and changes of fresh herbage allocation (HA) emerges as an alternative to manipulate the pattern of nutrient intake of grazing ruminants. The aim of this work was to assess total weight gain (TWG), daily weight gain (DWG), change in body condition score (CBCS), and estimate herbage intake (HI) when HA was allotted in the morning (0700; MHA) or afternoon (1500; AHA). This experiment occurred in July 2004 at the University of La Plata. Forty-eight beef heifers were randomized across two treatments during one measurement period of five weeks, in a complete randomized design. They grazed annual ryegrass pastures using strip grazing. Heifers were weighed and evaluated for BCS (1 to 5 scale) weekly. Herbage intake was estimated weekly by measuring herbage offered and refused. Total weight gain and HI were tested by ANOVA and

DWG and CBCS were analyzed as repeated measured in time; interactions between week x treatment were analyzed. The TWG (25.5 kg PM vs. 22.9 kg AM) differed between treatments (P < 0.05). There were significant interactions (P < 0.0001) in DWG and EBCS. These interactions indicate differences (P < 0.05) between treatments from the third to fifth week. Heifers in AHA gained 504 g (5.1 PM vs. 4.6 AM kg daily) and 0.28 points more weekly. Herbage intake did not differ between treatments (4.97 AHA vs. 4.46 MHA; P > 0.05). According to the results, the allocation of the new strip in the afternoon would increase the nutrient intake, leading to a greater efficiency of use of pasture.

Key Words: Grazing Time, Cattle, Performance

33 Effect of weaning date and pasture rotation frequency on weaning and post-weaning growth performance by fall-born calves grazing tall fescue pastures. K. Coffey*[1], W. Coblentz[1], R. Ogden[1], T. Smith[1], D. Scarbrough[1], D. Hubbell, III[1], C. Rosenkrans[1], and J. Jennings[2], [1]*University of Arkansas*, [2]*Cooperative Extension Service*.

Fall-calving cows grazing *Neotyphodium coenophialum* infected tall fescue pastures (IF) had greater than 93% conception rates, but their Gelbvieh-sired calves (n=184) weaned in April (avg. 189 d; EARLY) weighed 41 kg less in June than their calves weaned in early June (avg. 243 d; LATE). Our objective was to evaluate weaning and post-weaning effects of EARLY or LATE weaning from IF pastures managed with a twice monthly (2X) vs. twice weekly (8X) rotation schedule. At weaning, calves were gathered at approximately 0800 h from their respective pastures, weighed, commingled, transported directly to a local auction facility, housed overnight, returned to the research station the following morning, and placed in drylots and fed alfalfa hay and 0.9 kg/hd daily of ground corn for 21 d. At the end of the receiving period, calves were grazed as a group on common bermudagrass pastures. Interactions of treatments with year were detected (P<0.05) for most post-weaning measurements. Total BW loss during weaning, and time required to recover BW loss was greater (P<0.05) from LATE vs. EARLY in two of three years. LATE heifer BW was 60 kg greater (P<0.05) at breeding than EARLY in yr 1, but was only numerically higher by 28 and 10 kg in yr 2 and 3, respectively. In the first year, LATE 8X steers were heavier (P<0.05) at the time they were shipped to a feedlot than EARLY 2X and 8X steers; EARLY 8X steers weighed less (P<0.05) than the other treatment groups at the end of the feedlot period. Initial and final feedlot weights did not differ (P>0.10) among treatments in yr 2 or 3, but ending feedlot weights were 6 and 20 kg heavier numerically from LATE vs. EARLY. Therefore, rotation frequency had little impact on post-weaning calf performance, but weaning fall-born calves in mid-April may have negative impacts on long-term animal growth performance.

Key Words: Tall Fescue, Forage Management, Weaning

34 Incidence of fecal shedding of *E. coli* O157:H7 and *Salmonella* in stocker steers grazing different forages. M. L. Looper*[1], T. S. Edrington[2], R. Flores[3], C. F. Rosenkrans, Jr.[3], M. E. Nihsen[3], and G. E. Aiken[4], [1]*USDA-ARS, Dale Bumpers Small Farms Research Center*, [2]*USDA-ARS, Feed and Food Safety Lab*, [3]*University of Arkansas*, [4]*USDA-ARS, Forage Animal Production Research Unit*.

The incidence of fecal shedding of *E. coli* O157:H7 (EHEC) and *Salmonella* (SM) in stocker steers grazing different forages was determined in two experiments. In Exp. I, fecal samples were collected at d 0, 61, and 97 from crossbred (#8804 1/4 *Bos indicus*), yearling steers (initial BW = 260 ± 4 kg) grazing either endophyte-infected tall fescue (E+; n = 36) or common bermudagrass paddocks (CB; n = 32). On d 87, steers grazing E+ paddocks were confined to a dry-lot pen and fed CB hay *ad libitum* for 10 d. Fecal samples were collected at the end of the dry-lot phase (d 97). In Exp. II, fecal samples were collected twice from crossbred Angus steers (n = 30; initial BW = 314 ± 4 kg) grazing novel endophyte-infected tall fescue or E+ tall fescue for 63 d. Within forage type, steers were treated with either ivermectin (I) or fenbendazole (F). No steers shed SM during Exp. I. Further, no steers shed EHEC at d 0. At d 61, forage type did not influence (P > 0.10) fecal shedding of EHEC, and incidence of shedding was 6.3 and 5.6% for CB and E+ steers, respectively. More steers grazing CB (22%) were shedding EHEC than E+ steers fed CB hay (0%) at d 97 (P < 0.01). Average daily gain tended (P < 0.10) to be reduced in steers shedding EHEC

(0.87 ± 0.07 kg/d) than steers not shedding EHEC (1.0 ± 0.02 kg/d). In Exp. II, fecal shedding of EHEC was not influenced (P > 0.10) by forage or anthelmintic treatment. Overall, 3.3% of steers were shedding EHEC. Forage type did not affect (P > 0.10) fecal shedding of SM in steers. At the initial collection, 75% of steers were shedding SM, while only 3.3% of steers were shedding SM at the second collection. More I-treated steers (92%) were shedding SM than F-treated steers (60%) at the initial collection (P < 0.05). There was not an anthelmintic x

forage interaction for SM shedding (P > 0.10). Average daily gain was decreased (P < 0.05) in steers shedding SM and grazing E+ (0.68 ± 0.05 kg/d) compared with all other steers (1.1 ± 0.1 kg/d). We conclude that nutritional alterations and anthelmintic treatment may influence fecal shedding of pathogenic bacteria in growing beef cattle.

Key Words: Beef Cattle, Tall Fescue, E. Coli

Physiology

35 Hormonal profiles in pregnant ewes following intra-uterine inoculation with *Escherichia coli*. K. Moulton*[1], S. Willard[1], P. Ryan[1], A. Chromiak[1], D. Tucker[1], C. Klauser[2], S. Rodts-Palenik[2], C. Rose[2], J. Morrison[2], and W. Bennett[2], [1]*Department of Animal and Dairy Science,* [2]*Department of Obstetrics and Gynecology, University of Mississippi Medical Center.*

The objective of this investigation was to determine serum concentrations of progesterone, cortisol, and pregnancy-specific protein B (PSPB) in pregnant ewes inoculated with *Escherichia coli*. Timed-bred Cheviot ewes (105 ± 13 d of gestation) were allotted to the following intra-uterine inoculations: Saline-control (C; n=5), 1 million colony forming units (CFU) (LT; n=6), and 10 million CFU (HT; n=6) bacteria. Blood samples were collected by jugular venipuncture prior to inoculation and every 24 h post-inoculation until lambing or euthanasia because of fetal distress. After two (LT-group) ewes pre-term delivered 39 and 49 h post-inoculation, every 12 h a trans-abdominal ultrasound exam was performed to evaluate fetal viability of remaining ewes. Serum progesterone, cortisol and PSPB were quantified using RIA. Repeated measures ANOVA, with time and inoculation as variable, were used for statistical analysis. Twenty-four h after inoculation, the HT ewes had increased (P<0.05) cortisol (6.7 ± 0.74 mg/dL) compared to LT and C ewes (5.8 ± 0.74 and 4.5 ± 0.81 mg/dL, respectively). Twenty-four h after inoculation, the HT and LT ewes had increased (P<0.05) progesterone levels (20.4 ± 1.5 and 12.9 ± 1.5 ng/mL, respectively) as compared to C ewes (7.8 ± 1.7 ng/mL). Serum PSPB pre- and post-inoculation were not significantly different (P>0.05) for C, HT, and LT ewes. Pre-term delivery was 33% for LT ewes. Fetal viability for LT, HT and C ewes were 0, 66 and 100%, respectively. Although serum PSPB concentrations were not different, cortisol and progesterone may increase in pregnant ewes from stress associated with a localized uterine infection. Furthermore, these data suggest an effect of bacterial load on fetal viability and pre-term delivery with the LT being more detrimental than the HT dose.

Key Words: Sheep, Cortisol, Progesterone

36 Use of digital infrared thermal imaging to evaluate the effect of scrotal color on scrotal surface temperatures of hair sheep rams in the tropics. S. Augustin*, R. W. Godfrey, R. E. Dodson, and A. J. Weis, *Agricultural Experiment Station, University of the Virgin Islands.*

Digital infrared thermal imaging (DITI) is a non-invasive method of assessing scrotal surface temperature (SST). This project was conducted to evaluate the effect of scrotal color on SST of hair sheep rams. Sexually mature rams (St. Croix White n = 17, Barbados Blackbelly n = 9, Dorper n = 2, St. Croix White X Dorper n = 10) having either a dark (n = 10) or light (n = 28) colored scrotum were used. A Meditherm Vet 2000 Digital Infrared Thermal Imager was used to measure SST with the camera 0.4-0.8 m behind the ram in the chute. Images were analyzed using WinTES software (v 1.05.1027). Within each image the scrotum was divided into three horizontal sections (top, middle and bottom) of equal height covering the width of the scrotum. The WinTES software was used to calculate average SST for each section. The proximal to distal temperature gradient was calculated as the difference in mean SST between the top and bottom sections. Mean SST of each scrotum was calculated as the pooled average of the three horizontal sections. All data were analyzed using GLM procedures of SAS using scrotum color as the main effect. The temperature gradient was greater (P < 0.004) in light than in dark scrotums (2.26 ± 0.18 vs. 1.20 ± 0.29 °C, respectively). Within the top, middle and bottom sections SST was higher (P < 0.02) for light colored scrotums than it was for the dark colored scrotums. Mean SST of dark scrotums was lower (P < 0.009) than that

of the light scrotums (36.93 ± 0.87 vs. 39.71 ± 0.52 °C, respectively). These results indicate that dark colored scrotums are cooler than light colored scrotums of hair sheep rams in the tropics and have less of a temperature gradient from the proximal to the distal region. The lower temperature gradient of the dark colored scrotums may make it more difficult to detect abnormalities that could be used to indicate potential fertility problems. This project was partially supported by grant MBRS-RISE 5R25GM061325-04.

Key Words: Sheep, Scrotum, Thermography

37 Effect of pyruvate and lactate on motility of cold stored stallion spermatozoa. G. Webb* and C. Dekat, *Southwest Missouri State University.*

Inclusion of salt solutions such as Tyrode's or PBS supplemented with lactate, pyruvate and/or BSA as components of semen extender has been shown to be beneficial for some stallions. Recent studies have been conducted in an effort to determine if the pyruvate in these solutions is acting as an antioxidant. The purpose of this study was to determine if the addition of lactate, or lactate plus pyruvate to a Tyrode's media used to supplement skim milk-glucose extender would prevent a decrease in motility when stallion semen was challenged with H_2O_2 and stored between 5^0-10^0 C for 24 and 48 h. Treatments consisted of skim milk-glucose extender (SKMG) supplemented at a ratio of 2:1 with Tyrode's solution (TO) (Sigma # T2145), or Tyrode's plus 20mM lactate (Sigma # L1375) without (TL) and with (TLP) 6mM pyruvate (Sigma # P4562). Each extender treatment was challenged with four levels of H_2O_2 (0, 0.4, 0.8, 1.6 mM) resulting in a total of 12 treatments. Three ejaculates were collected from each of four stallions. Each ejaculate was split into 12 aliquots which were centrifuged at 400 x g to remove the majority of seminal plasma and re-suspended with one each of the 12 extender treatments. Following storage in a static cooling device (Equine Express, Jon Wiseman, York, PA) samples were analyzed by a computer-assisted sperm analysis system for total and progressive motility of spermatzoa. After 24 and 48 h of storage the highest level of H_2O_2 resulted in a significant decrease in total and progressive motility ($P < 0.01$). Motility of spermatozoa stored in TO was significantly lower after 24 h ($P < 0.05$) and 48 h ($P < 0.001$) than that of spermatozoa stored in TL or TLP which did not differ ($P > 0.05$). These results suggest that the benefit provided by inclusion of pyruvate as a component of diluents for stallion semen is due to utilization of these compounds as readily metabolizable energy sources rather than as an antioxidant.

Key Words: Stallion, Semen, Pyruvate

38 Motility characteristics of boar spermatozoa during long-term storage in different extenders. M. Estienne*[1], J. Day[2], and A. Harper[1], [1]*Virginia Polytechnic Institute and State University,* [2]*Auburn University.*

Numerous extenders exist for diluting boar semen but relatively little research has been conducted to compare extenders with regard to maintaining sperm motility during storage. The objective was to assess various motility characteristics of boar spermatozoa stored in commercially available extenders using a computer-assisted sperm analysis system (Hamilton Thorne Research; Beverly, MA). Ejaculates from crossbred boars (n = 10) were collected and sub-samples from each ejaculate were diluted (35 x 10^6 spermatozoa/mL) in the following extenders: BTS, MIII, Androhep-lite, Sperm Aid, MR-A, Modena, X-Cell, VSP and Vital. Samples were stored for 10 d at 18° C and sperm motility was assessed daily after an aliquot was warmed to 37° C for 30 min. An effect of extender x day was detected (P < 0.0001) for percent motility,

percent progressive motility, track speed (average velocity measured over actual point to point track followed by cell), path velocity, progressive velocity, straightness, and linearity. In general, motility characteristics were better maintained by extenders typically considered suitable for long-term storage of 6 to 7 d (e.g., Androhep-lite, MR-A, X-Cell). For example, percent motility on d 7 of storage (90.7 ± 1.2) was greatest for MR-A. The percentage of spermatozoa exhibiting progressive motility (63.9 ± 1.5), and path velocity (106.4 ± 1.7 μ/s) on d 7 was greatest for X-Cell. Progressive velocity (78.3 ± 1.3 μ/s), straightness (73.2 ± 0.4) and linearity (44.1 ± 0.4) on d 7 were greatest for Androhep-lite. However, on d 7, track speed (198.2 ± 3.1 μ/s) was greatest for VSP, generally considered a mid-term extender for storage of up to 4 d. In summary, changes in sperm motility during storage were affected by the extender utilized. Further research is necessary to determine how changes in various characteristics of sperm motility may potentially affect fertility of stored semen. (Funded by the Virginia Pork Industry Board)

Key Words: Spermatozoa, Extenders, Boar

39   The acute-phase response of cloned pigs following an immune challenge. J. Carroll*[1], B. Carter[2], S. Korte[3], S. Dowd[1], and R. Prather[4], [1]*Livestock Issues Research Unit, ARS-USDA, Lubbock, Texas,* [2]*College of Veterinary Medicine, Kansas State University, Manhattan,* [3]*Department of Veterinary Pathobiology, University of Missouri, Columbia,* [4]*Department of Animal Science, University of Missouri, Columbia.*

Perinatal and early postnatal death continues to be a concern in cloned animals. Reports indicate that neonatal cloned calves, lambs, goats and piglets die of bacterial infections and sudden death of unknown causes. Therefore, our objective was to evaluate the acute-phase response (APR) in cloned pigs derived from 2 different cell lines [C1 (n = 7) and C2 (n = 2)] as compared to genetically similar non-cloned pigs (CONT; n = 11) following a lipopolysaccharide (LPS; 25 ug/kg BW) challenge. Pigs were weaned at 21 d of age and maintained in individual pens in the same room until sample collection 1 wk later. Blood samples were collected every 30 min for 2 h prior to and 4 h after the LPS challenge. Serum samples were analyzed for cortisol, tumor necrosis factor-alpha (TNF) and interleukin 6 (IL-6). Average gestational length for cloned pigs, 118.8 ± 0.97 d, was longer (P < 0.005) than that of CONT pigs, 114 ± 0.41 d. For serum cortisol there was a time by group interaction (P < 0.0001) such that the cortisol response was greater in CONT pigs as compared to C1 pigs (P < 0.0001), but not different from C2 pigs (P > 0.74). A time by group interaction (P < 0.0001) was observed for serum TNF such that the TNF response was greater in CONT pigs as compared to C1 pigs (P = 0.0002) and tended to be greater (P < 0.06) than C2 pigs. A time by group interaction (P < 0.0001) was also observed for serum IL-6 such that the serum IL-6 response was greater (P < 0.003) in CONT pigs as compared to C1 pigs and there was a trend (P = 0.10) for serum IL-6 to be greater in CONT pigs compared to the C2 pigs. These are the first results to demonstrate that cortisol and proinflammatory cytokine profiles associated with the APR of cloned pigs are altered compared to genetically similar non-cloned pigs. Our results also indicate that the cell line from which clones are derived may dictate the APR. The hormone and cytokine profiles reported herein are a significant contribution towards our understanding, and perhaps our ability to prevent or reduce the incidence of premature deaths in cloned animals and warrants further investigation of the immune system of cloned animals.

Key Words: Clones, Pigs, Immune System

40   Cortisol concentrations in gilts housed individually in stalls or in groups in pens during the first 30 d post-mating. M. Estienne*, A. Harper, and J. Knight, *Virginia Polytechnic Institute and State University.*

In the U.S., most sows are individually housed throughout gestation in stalls that allow only standing, sitting and lying. This severe restriction of freedom of movement has been robustly criticized by many animal right and welfare activists, who suggest stall-housed sows and gilts are more stressed and suffer from poorer welfare than females housed in group pens. The objective of this study was to assess serum cortisol concentrations in gilts housed individually in stalls or in groups in pens for the first 30 d after mating. Gilts (n = 56; 159.5 ± 1.5 kg BW; 15.0

$\pm$ 0.5 mm backfat) were mated via AI twice during estrus. After the second AI, gilts were placed in stalls (0.6 x 2.0 m) (n = 14) or pens (1.7 x 3.1 m) containing three gilts each (n = 14), and were fed at a rate of 2 kg/gilt/d. At d 30 post-mating, blood samples were collected via jugular venipuncture. Serum was harvested following centrifugation and cortisol concentrations determined using RIA. Concentrations of cortisol in serum were greater (P < 0.06) in stall-housed gilts (79.4 ± 7.8 ng/mL) compared with gilts housed in pens (57.1 ± 7.8 ng/mL). Based on this single measurement, it is tempting to suggest that stall-housed sows were more stressed and had poorer welfare than pen-reared counterparts. However, we previously reported that the gilts housed in stalls in this same study had fewer wounds, less severe lameness scores, and higher pregnancy rates compared with the gilts kept in pens (Estienne et al., 2004; J. Anim. Sci., 82[Suppl. 1]:458). These combined data illustrate the importance of assessing risks to welfare on the basis of multiple physiological and behavioral measurements and corresponding changes in measures of fitness such as reproduction. (Funded by the Virginia Agricultural Council)

Key Words: Cortisol, Housing, Gilts

41   Effects of GnRH in combination with PGF$_2\alpha$ on ovarian function in post-pubertal Holstein heifers. R. Harper[1], W. Bennett[2], E. Cuadra*[1], C. Vaughn[1], and N. Whitworth[2], [1]*Alcorn State University,* [2]*University Medical Center.*

Forty-two cycling holstein heifers were randomly alloted by weight, age and body condition score to one of three treatments to test the hypothesis that GnRH treatment induces an earlier luteal response to PGF$_2\alpha$. Body condition among heifers ranged between 3 and 4 (BCS 1 = thin; BCS 5 = obese). Heifers in the control group (n = 14) received two injections of PGF$_2\alpha$ (25 mg im; Lutalyse) given 10 days apart. Groups 2 (n = 14) and 3 (n = 14) received an additional injection of GnRH (100 μg im; Cystorelin) after the first and second injection of PGF$_2\alpha$, respectively. Heat detection began immediately after PGF$_2\alpha$ and continued 80 h afterward. Blood samples were collected weekly starting two weeks before the hormonal treatment was initiated; however, the fourth sample was collected immediately before the second injection of PGF$_2\alpha$ and then continued weekly for two more weeks. Heifers were artificially inseminated 12 h after an observed standing estrus following the second injection of PGF$_2\alpha$ and pregnancy diagnosed at 60 days. The number of heifers responding to the second injection of PGF$_2\alpha$ and the number of pregnant heifers of those responding did not differ among the three experimental groups (P > 0.05). However, there was a trend (P < 0.10) toward a lower estrus response in group 3 (3/14) when compared to the control (11/14) and group 2 (10/14). Pregnant heifers in group 2 had significantly lower plasma progesterone (0.44 ± 0.09 vs. 1.72 ± 0.56 ng/mL) a week after the second injection of PGF$_2\alpha$ than the non-pregnant animals in that group (P < 0.05). Similar results were observed in the control group but only within the responding heifers (0.61 ± 0.08 vs. 0.93 ± 0.03 ng/mL; P < 0.05). Plasma progesterone remained steady in samples collected before the first and second injection of PGF$_2\alpha$ in heifers in group 2 (1.48 ± 0.37, 1.23 ± 0.39, 1.96 ± 0.36 ng/mL) despite the first injection of PGF$_2\alpha$. This data suggests that administration of GnRH following PGF$_2\alpha$ alters bovine luteal and/or follicular cell function.

Key Words: GnRH, Prostaglandin, Ovarian

42   Utilization of progesterone releasing devices on improving reproductive performance of ⁄at-risk⁄ beef cows. R. C. Vann*[1] and T. Engelken[2], [1]*MAFES-Brown Loam Experiment Station,* [2]*CVM-Mississippi State University.*

The objective of this study was to evaluate whether the use of Eazi-breed CIDR^{TM} and Lutalyse^{TM} can improve the reproductive performance of ⁄at-risk⁄ beef cows kept in bull-bred beef herds. ⁄At-risk⁄ cows were defined as follows: 1) did not calve in the first 42 d of the calving season, 2) at least 20 d postpartum at CIDR^{TM} insertion, 3) only parities 2 to 8 included, and 4) a BCS equal to or greater than 4 (1 to 9 scale). Forty-six lactating beef cows were randomly assigned to two treatment groups: control or CIDR-Lutalyse^{TM} group. Cows were blocked according to days postpartum (DPP) as follows: Block 1, 20 to 29 DPP at CIDR^{TM} insertion, Block 2, 30 to 39 DPP at CIDR^{TM} insertion, and Block 3, 40 to 49 DPP at CIDR^{TM} insertion. All bulls passed breeding soundness exams prior to the breeding season. The mature bull to cow ratio (1:30)

was used within each pasture. Pregnancy diagnosis was performed by rectal palpation 45 d after the end of the breeding season (75 d). The cows in the CIDR-Lutalyse[TM] group cycled earlier after calving as evidenced by the greater (P < 0.05) number of days pregnant (i.e. age of fetus at palpation) (78.2 ± 6.8 vs 59.6 ± 6.2 d, respectively) compared to the control group. There were no differences in cow weight between the treatment groups. The average BCS score for the CIDR-Lutalyse[TM] group was 5.8 ± 0.14 and for the control group was 5.4 ± 0.13. The average DPP was similar between the CIDR-Lutalyse[TM] (38.2) and control groups (38.7). There was a 100% (23/23) conception rate in the CIDR-Lutalyse[TM] group and a 78% (18/23) conception rate in the control group. In summary, the use of CIDR[TM] and Lutalyse[TM] can improve the reproductive performance of ′at-risk′ beef cows by shortening the return to estrus and increasing the number of days pregnant (i.e. age of fetus at palpation) in late calving beef cows.

43   Effects of intra-vaginal progesterone releasing devices on the survival of embryos transferred to recipient suckling multiparous beef cows. E. J. Cuadra[1], R. C. Vann*[2], W. A. Bennett[3], R. Johnson[1], S. T. Willard[4], and T. Kiser[4], [1]Alcorn State University, [2]Brown Loam Experiment Station, [3]University of Mississippi Medical Center, [4]Dept of Animal & Dairy Science, Mississippi State University.

The objective of this study was to evaluate the effects of intra-vaginal progesterone releasing devices (CIDR[TM]) on the survival of embryos transferred to suckling multiparous beef cows. Twenty-eight Angus crossbred cows were randomly assigned to two treatment groups: control and CIDR[TM], following estrous synchronization. On d 7, after exhibiting estrus, cows in both groups received embryos (in mid May), which were placed in the uterine horn of the ovulating side, after manual evaluation of the viability of the corpus luteum. On that same day, the cows in the CIDR[TM] treatment group (n=14) had a CIDR[TM] inserted after embryo insertion and the control group did not receive a CIDR[TM] after embryo insertion. The CIDR[TM] was removed 14 d later in the CIDR[TM] treatment group. Embryos had been previously frozen in glycerol and stored in liquid nitrogen. Body weights were recorded at the beginning and end of the project. Blood samples for progesterone analysis were taken immediately before insertion and removal of the CIDR[TM] and continued weekly until d 40 after insertion of the CIDR[TM]. Pregnancy was diagnosed by rectal palpation 90 d after embryo insertion. No significant differences (P > 0.05) were detected in cow body weight. Pregnancy retention rate (P #8804 0.085) for the control group was 28.6% (4/14) in contrast with 64.3% (9/14) for the CIDR[TM] treatment group. These data appear to indicate that CIDR[TM] may play an advantageous role in achieving greater numerical differences in pregnancy retention rate following embryo transfer.

44   Effects of supplemental progesterone in a timed insemination protocol in beef heifers. N. Post*, D. Kreider, R. Rorie, and T. Lester, University of Arkansas.

An experiment was conducted to compare two progestin based estrus synchronization protocols for timed AI (TAI) with the addition of supplemental progesterone (P4) in beef heifers. Angus-cross heifers approximately 14.5 months of age at breeding were sorted by body condition score (BCS), and BW; then randomly assigned to one of two treatments. Treatments were MGA (0.5 mg/hd/d) for 14 d followed by 25 mg Lutalyse (PG) 17 d after MGA withdrawal and GnRH (100 μg Fertagyl) 48 h after PG (MPGG; n = 51), and 100 μg GnRH plus a Eazi-Breed CIDR inserted for 6 d with PG at the time of withdrawal followed in 48 h by GnRH (CIDR; n = 49). All heifers were inseminated 18 h after GnRH. Four d after TAI fifty-two heifers in both treatments (MPGG, n = 27; CIDR, n = 25) received supplemental P4 (MGA, 0.5 mg/hd/d) for 7 d. Bulls were then placed with heifers 10 d after AI. Conception rate (CR) was determined by ultrasound 40 d post AI and overall pregnancy rate (OPR) was determined by rectal palpation 55 d after bull removal. Both MPGG and CIDR treatments had CR of 47%, and OPR was 77% and 74% for MPGG and CIDR, respectively. For the treatments combined, CR for heifers receiving supplemental P4 was 56% compared to 38% for heifers not receiving supplemental P4 (P = 0.06). Retrospectively animals were grouped such that heifers with a BCS greater than

5.5 were classified as BCSHigh (n = 49) and heifers less than 5.5 were classified as BCSLow (n = 51). There was no difference in CR and OPR between BCSHigh and BCSLow (P #8805 0.9). Heifers in the BCSHigh classification receiving supplemental P4 had a CR of 50% versus 43% for no supplemental P4 (P = 0.64) and an OPR of 69% versus 82% for no supplemental P4 (P = 0.27). Animals in the BCSLow classification receiving supplemental P4 had a CR of 62% versus 32% for heifers not receiving supplemental P4 (P = 0.03) and an OPR of 85% versus 64% for the non supplemental P4 heifers (P = 0.09). This study indicates that the addition of supplemental P4 increases CR and OPR in two progestin synchronization protocols, as well as in heifers with a BCS less than 5.5.

45   Effect of melengestrol acetate (MGA) and monensin supplementation on puberty and pregnancy rates in crossbred beef heifers. J. L. Roberts[1], R. P. DelVecchio[1], G. T. Gentry, Jr.*[1,2], D. Sanders[2], P. E. Humes[1], and R. A. Godke[1], [1]Department of Animal Sciences, LSU Agricultural Center, [2]Idlewild Research Station.

Objectives of this study were to determine the effect of MGA and sodium monensin (MON) post-weaning supplementation on the onset of puberty and pregnancy rates in crossbred beef heifers. Treatments included (1) Control (CONT, base ration), (2) MGA (base ration plus 0.5 mg/hd daily of MGA in three 14-d intervals starting at 11 mo of age), (3) MON (base ration plus 200 mg/hd daily MON starting at 10 mo of age) and (4) MON and MGA (MON + MGA, combination of both the MGA and the MON treatments). The base ration was a 12.5% CP Corn-SBM diet fed at 2.27 kg/hd daily. Years 1 and 2 included 45 (mean of 217 kg initial BW) and 40 (mean of 235 kg initial BW) crossbred beef heifers, respectively. Each year, heifers were stratified by weight and randomly allotted to one of four treatment groups. Heifers were synchronized with two injections of PG (25 mg, im) 11 d apart at ∼14 mo of age and were monitored for estrus and inseminated using the am/pm rule, then bull exposed for 60 d. The ovaries of heifers were examined at 2- to 3-d intervals via transrectal ultrasound starting after MGA withdrawal and continuing for #880512 d. Overall, the MON + MGA-treated heifers had more CL/female throughout the study compared with those in the other three treatment groups. Generally, the MGA-treated group had more (P<0.05) large follicles/female and the MON + MGA group had greater reproductive tract scores than did those in the CONT group. Overall, more (P<0.05) heifers in the MON (95%) and MON + MGA (91%) groups were pregnant after the breeding season compared with those in the CONT group (61%), and more (P<0.05) MON-treated heifers were pregnant compared with MGA-treated heifers (71%). Based on a 45-d palpation both MON and MON + MGA groups had more advanced fetuses than those in the CONT group. Results indicate that supplementation with sodium monensin and/or multiple MGA priming resulted in increased reproductive performance in crossbred beef heifers.

46   Growth traits and reproductive parameters of Holstein and Gir (Bos indicus) x Holstein bulls and heifers. A. Denson*[1], S. Schmidt[1], S. Bowers[1], T. Dickerson[1], K. Graves[1], R. Vann[2], and S. Willard[1], [1]Department of Animal and Dairy Sciences, Mississippi State University, [2]Brown Loam Branch Experiment Station.

Among the Bos indicus breeds, Gir and Gir-crossbred dairy cattle have the highest milk production potential, yet little data exists regarding the growth and reproductive performance of Gir x Holstein (G x H) cattle within US production systems. The objective of this study was to compare the peripubertal growth and reproductive traits of Holstein (H x H; n = 7 and 17, respectively) versus G x H (n = 7 and 21, respectively) crossbred dairy bulls and heifers. Body weight (BW), heart girth (HG), hip width (HW), hip height (HH), wither height (WH) and body length (BL) measurements were recorded from birth to 18 mo in bulls and to first estrus and conception in heifers at 28-d intervals. Scrotal circumference (SC) and ejaculate concentration, motility and morphology of spermatozoa following electroejaculation in bulls were determined at 12 and 18 mo. Estrus characteristics (estrus duration, mount duration and frequency) in heifers were determined by HeatWatch until pregnancy confirmation. G x H bulls displayed greater (P < 0.05) HW than H x H bulls at 12 mo, while BW, HG, HH, WH and BL did not differ (P

> 0.10) between genotypes. At 18 mo, growth measurements did not differ (P > 0.10) between G x H and H x H bulls. SC at 12 mo and ejaculate characteristics at 12 and 18 mo did not differ (P > 0.10) between genotypes, while G x H bulls exhibited greater (P < 0.05) SC at 18 mo than H x H bulls. G x H heifers exhibited greater (P < 0.05) days to first estrus, days to conception, HW and HH at estrus and BW at conception than H x H heifers, while HG, WH, BL and BW at estrus and HG, HH, HW, WH and BL at conception did not differ (P > 0.10) between genotypes. H x H heifers exhibited a greater (P < 0.05) mount frequency than G x H heifers, while duration of estrus and mount duration did not differ (P > 0.10) between genotypes. In summary, G x H and H x H bulls exhibited similar growth and reproductive traits. In contrast while G x H and H x H heifers displayed similar growth traits, G x H heifers achieved reproductive maturity much later than H x H heifers. [Funded, in part, by USDA-IFAFS]

Key Words: Dairy, Growth, Reproduction

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47 Puberty in beef heifers fed high or low starch diets.
R. P. Wettemann*, N. H. Ciccioli, S. L. Charles-Edwards, H. T. Purvis, K. S. Lusby, G. W. Horn, and D. L. Lalman, *Oklahoma Agricultural Experiment Station.*

Spring-born Angus x Hereford heifers were used to determine the effects of energy supplementation programs and amount of starch in the diet on the incidence of puberty. Heifers grazed dormant native grass and were fed 0.9 kg/d of a soybean meal supplement (42% CP) from weaning in October to late February, and then were randomly assigned to treatments for 60 d prior to the breeding season. In two years, control heifers (CON, n = 46) grazed native grass and received 0.9 kg/d of SBM supplement; low-starch (LS, 15% CP; n = 46) heifers were self-fed a distillers grain and soybean hull based diet in drylot, and high-starch (HS, 15% CP; n = 46) heifers were limited-fed a corn based diet in drylot. Body weight of heifers in year 1 at the start of treatment (211 kg) was less than in year 2 (245 kg). Daily weight gain for HS (0.89 kg/d) and LS heifers (0.84 kg/d) for both years did not differ (P > 0.15), and CON heifers gained less weight (P < 0.001; 0.22 and 0.51 kg/d, in years 1 and 2, respectively). Pubertal BW (313 ± 6 kg) was not influenced by treatment, but HS and LS heifers were younger (P < 0.03) than CON heifers at puberty. Survival analyses indicated that the percentages of prepubertal heifers during the 8 wk after treatment were less for HS and LS compared with CON heifers (P < 0.002) and less (P < 0.05) for HS than LS in year 1. Less (P < 0.02) HS and LS than Con heifers were prepubertal during 8 wk after treatment in year 2, but the percentages of prepubertal heifers did not differ for LS and HS. Feeding a diet with a greater amount of starch for 60 d prior to breeding may increase the incidence of puberty during breeding of heifers that have inadequate yearling weight.

Key Words: Beef Cattle, Nutrition, Puberty

Small Ruminant Production

48 The effect of hCG on circulating progesterone in goats at the end of the breeding season. A. Landry*, H. DiMaggio, W. Burnside, L. Sarradet, J. Saenz, D. Landry*, L. Gentry, K. Bondioli, and R. Godke, *Department of Animal Sciences, Louisiana State University Agricultural Center.*

Caprine does have been reported to lack functional luteal tissue at the end of the breeding season (Gootwine et al., 1997). The objective of this study was to monitor circulating progesterone (P_4) levels in does after administration of human chorionic gonadotropin (hCG) during metestrus at the end of the breeding season (spring transition period). Meat-type does were detected in estrus during the breeding season (November) (n = 12, Group I) and the spring transition period (February) (n = 25, Group II and n = 26, Group III). Does within seasonal Groups I, II and III were randomly allocated to one of two treatments. Does in the hCG-treated group (Treatment A) received 500 IU hCG i.m. and does in the control group (Treatment B) received an equal volume of saline (0.5 ml) i.m. at 48 and 72 h after the onset of standing estrus. At estrus, all does in Group III were exposed to a fertile buck. Blood samples were collected at estrus (day 0) and at 7-day intervals until day 21 in Groups I and II and day 28 in Group III. Overall, there was no significant difference in circulating P_4 levels between seasonal groups (P>0.10). Mean circulating P_4 levels were significantly higher in hCG-treated does (Treatment A) than control does (Treatment B) across all seasonal groups (P<0.01). P_4 levels in does that became pregnant were higher than in nonpregnant does (P<0.01). Circulating P_4 levels were also significantly different with day of blood sample collection (P<0.01). There was no difference in pregnancy rates (54 vs. 58 %) or kidding rates (200 vs. 186 %) between the two treatments in Group III. In summary, transitional luteal insufficiency (evaluated by monitoring circulating P_4) was not detected in this study. Administration of hCG to mixed breed goats during metestrus in the spring transition period did affect circulating P_4 levels but did not improve the pregnancy rate over that of control-treated does.

Key Words: Caprine, Progesterone, Season

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49 Hair sheep performance in an accelerated lambing and extensive management system in the tropics: A ten year summary. R. W. Godfrey*, J. R. Collins, E. L. Hensley, H. A. Buroker, J. K. Bultman, and A. J. Weis, *Agricultural Experiment Station, University of the Virgin Islands.*

Production records of St. Croix White (STX) and Barbados Blackbelly (BB) hair sheep were evaluated over a 10-yr period. Ewes were managed in two flocks using accelerated lambing and extensive management. One flock was composed of STX (n = 30 to 35) and the second flock had STX (n = 30 to 40) and BB (n = 20 to 25) ewes. Each flock grazed guinea grass (*Panicum maximum*) year round in a rotational grazing system. The larger flock grazed eight 0.8 ha pastures and the smaller flock grazed eight 0.4 ha pastures. Single sire breeding took place during 35-d periods in February, June and October, and was staggered between the flocks so that each flock produced three lamb crops every 2 years. Lambs were weighed and tagged at birth and weighed at weaning at 63 d of age. Replacement ewe lambs moved out of their maternal flock and ram lambs stayed in the flock for breeding. Replacement animals were selected for multiple births, breed characteristics and adjusted weaning weight using an index. Ewe fertility (ewes lambing per ewe exposed) averaged 89.8 % over the entire period. Ewe prolificacy (lambs born per ewe lambing) increased (P < 0.0001) from 1.75 to 2.01 during the 10-yr period. Ewes that were bred in October had higher prolificacy (P < 0.0001) than ewes that were bred in February or June (1.87 vs. 1.64 vs. 1.73 lambs per ewe lambing, respectively). Ewes bred during October had a higher percentage of multiple births (P < 0.0001) than ewes that were bred in February or June (76.5 vs. 60.7 vs. 68.9 %, respectively). The percentage of live lambs at weaning increased (P < 0.0001) from 78.1 to 91.3 %. Litter weaning weight increased (P < 0.0001) from 13.1 kg to 20.9 kg during the 10-yr period. Ewe productivity, expressed as the ratio of litter weaning weight to ewe body weight, increased (P < 0.0001) from 41.6 to 50.3 % during the 10-yr period. These results show that hair sheep productivity can be sustained and enhanced using accelerated lambing and extensive management in the tropics.

Key Words: Hair Sheep, Breeding, Management

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50 Use of melengestrol acetate (MGA) feeding to synchronize mating in hair sheep and meat goats during seasonal breeding. S. Wildeus*[1], D. H. Keisler[2], and J. R. Collins[1], [1]*Virginia State University,* [2]*University of Missouri.*

The efficacy of melengestrol acetate (MGA), either alone or in combination with PG-600 to synchronize estrus and advance breeding in small ruminants was evaluated, using 90 mature meat breed does and hair sheep ewes. Animals equally represented breed types within species, and were allocated to the following treatment groups: (1) a corn/soybean supplement (16% crude protein) without MGA , (2) the same supplement with MGA, or (3) MGA supplement followed by an injection of 2.5 ml PG600 (200 IU eCG/100 IU hCG) at the end of feeding. Supplement was fed once daily for 14 d at 1% BW, and provided MGA at 1.13 μg/kg BW/d in groups 2 and 3. Prior to and during supplement feeding, females had no fence line contact with males. Females were mated in 6 single-sire groups with a mature male of like breed, that had passed a libido test and semen evaluation. Males were fitted with a marking harness to aid in estrus detection. Estrus was recorded in 8-h

intervals for 4 d, and daily for the remainder of the 30 d mating period. Pregnancy status and fetal numbers were determined by transrectal ultrasound at the end of mating and 25 d thereafter. At kidding/lambing litter size was recorded. Time to first estrus after male introduction was shorter (P<0.05) in the MGA and MGA+PG600 groups than the control group (4.8 and 5.7 vs. 8.0 d, respectively), while time to conception was shorter (P<0.05) for MGA (4.8 d) than for MGA+PG600 (7.0 d), which was shorter (P<0.05) than control (10.9 d). The percentage of females bred at first estrus (80.0 - 86.7%), kidding/lambing (90 - 96.7%), and litter size at birth (1.96 - 2.13) was not different (P>0.1) between treatment groups. Gestation length was longer (P<0.01) in both MGA-treated groups (149.9 d) than the control group (148.6 d). Time to first estrus was shorter (P<0.01) in sheep (4.4 d) than in goats (8.0 d). Data suggest MGA advanced and synchronized the onset of breeding, resulting in all MGA treated sheep to be bred within 6 d of onset of mating. There was no added benefit from treatment with PG600, when used during seasonal breeding.

Key Words: Hair Sheep, Goats, Melengstrol Acetate

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51   Effects of oocyte transport methods on maturation rate in sheep. B. Sayre*, *Virginia State University*.

The effective utilization of IVM and IVF procedures may involve the transport of oocytes from the source over great distances. One option is to isolate oocytes at the source and place them in maturation media. However, this requires adequate facilities and expertise that may not always be available. The objective of this experiment was to determine alternative methods of sheep oocyte transport. Ovaries were collected at a commercial slaughter facility, and oocytes were transported to the lab either within the ovary in DPBS (OV), or in follicular fluid alone (FF) or with the addition of 25% (v/v) TCM199-Hepes media (FFM) after aspiration at the source, or after slicing follicles at the source into SOF-Hepes (SOFCHX) or TCM199-Hepes (TCMCHX) with cyclohexamide (10 μg/mL). All treatments were transported at 32 C in a portable incubator. After transport to the lab, oocytes were isolated (OV isolated via slicing in SOF-Hepes) and placed in maturation media [TCM199 containing LH (0.01 IU), FSH (0.01 IU), EGF (50 ng/mL), and cysteine (0.6 mM)] for 24 h at 38 C in 5% CO2 and air. The experiment was replicated three times with a total of 278 oocytes and an average of 22, 10, 8, 26, and 14 oocytes/replicate for OV, FF, FFM, SOFCHX, and TCMCHX, respectively. Oocyte maturation was determined by cumulus cell expansion and the presence of a polar body. Differences among treatments were determined with analysis of variance. The average time from ovary collection to start of maturation was 13 h. There were no differences among treatments, except that maturation rate was reduced (P<0.05) in TCMCHX (84, 81, 89, 86, and 48% matured for OV, FF, FFM, SOFCHX, and TCMCHX, respectively). The average number of usable oocytes was greater (P<0.05) in treatments where the ovary was sliced (21 oocytes/collection) vs aspirated (9 oocytes/collection) for collection, but maturation rate did not differ between methods (73 vs 86% matured, respectively). Transport of oocytes within the ovary, follicular fluid, or SOF media containing CHX may be effective methods for moving oocytes over long distances for IVM and IVF procedures.

Key Words: Sheep, Oocyte, Maturation

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52   Application of a bovine electronic estrus mount detection system for use in goats and hair sheep. S. Wildeus* and J. R. Collins, *Virginia State University*.

As part of a project to determine the timing of estrus and ovulation following the induction of ovulation with hCG, the efficacy of an electronic heat mount detection system for cattle (HeatWatch®) was evaluated for use in hair sheep and meat goats. Mature mixed breed does (n=10) and ewes (n=10), were moved into 4 semi-enclosed pens (45 m^2 each; 5 does or ewes/pen), and synchronized using medroxyprogesterone acetate vaginal sponges (50 mg; 11 d), and eCG/hCG at time of sponge removal. At sponge removal pouches with mount transmitters were placed on does and ewes, and harnessed teaser males were introduced. Animals were observed for visual estrus marks (VR) at 4-h intervals for 72 h. Following pen observations, females together with teaser males were moved to pasture and estrus observations continued daily for 30 d. All HeatWatch contact events (ER) were transmitted to a computer and stored. VR were observed in 7/10, and ER in 6/10 does in response to estrus synchronization, however, VR and ER coincided in only 4 of the does.

Contact time (duration of mount) for ER in does ranged from 1 to 4 sec, and multiple ER (>2 events) were recorded in 2 does, projecting an estrus duration of 11 to 12 h. VR were observed in 9/10, and ER in 7/10 ewes to the synchronized estrus, with observations coinciding in 5 ewes. Contact time for ER in ewes ranged from 1 to 5 sec, and multiple ER (>2 events) were recorded in 3 ewes, projecting an estrus duration of 18 to 48 h. Under pasture conditions, ER were recorded in 3 does and 5 ewes, but recordings coincided with VR in only two instances. Multiple ER (>3 events) occurred in only 3 ewes, and projected an estrus duration of 16 to 27 h. Pouches with transmitters were lost in 7/20 animals prior to termination of the 30 d pasture observation period. Data from this trial suggest that modifications to pouch placement/mounting and contact plate area/design may be needed to generate reliable observations on incidence, onset and duration of estrus in goats and hair sheep when using the HeatWatch system.

Key Words: Hair Sheep, Goats, Estrus Detection

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53   Initial assessment of three meat goat breeds for preweaning doe-kid performance. R. Browning, Jr.*, S. Kebe, T. Payton, B. Donnelly, P. Pandya, and M. Byars, *IAgER - Tennessee State University*.

Boer (BR; n = 43), Kiko (KK; n = 38), and Spanish (SP; n = 47) does were exposed to bucks (three per sire breed) in single-sire groups using a complete three-breed diallel mating scheme to assess doe-kid performance. At spring kidding, 39 BR, 38 KK, and 45 SP does produced at least one live kid. Dam weights at kidding were lighter (P < 0.01) for SP (42.9 ± 1.2 kg) than for KK and BR (49.5 and 49.7 ± 1.3 kg, respectively). Litter size and litter weight at birth were affected by sire breed x dam breed interactions (P < 0.01), ranging from highs for BRxSP matings (2.32 ± 0.16 kids, 7.82 ± 0.44 kg) to lows for SPxBR matings (1.53 ± 0.17 kids, 5.46 ± 0.48 kg). Kid birth weights were similar (P = 0.4) among dam breeds. Birth weights were heavier (P < 0.01) for BR-sired kids (3.50 ± 0.09 kg) than for KK- and SP-sired kids (3.19 ± 0.09 kg). By weaning at 3 mo, 33 BR, 38 KK, and 45 SP dams had reared at least one kid. Dam weights at weaning were lighter (P < 0.01) for SP (43.1 ± 1.2 kg) than for KK and BR (49.5 and 50.1 ± 1.4 kg, respectively). Litter size was not affected (P = 0.14) by dam breed (SP = 1.94 ± 0.09; KK = 1.75 ± 0.1; BR = 1.69 ± 0.1 kids). Litter weaning weights (90-d adjusted) were affected by a moderate (P = 0.08) sire breed x dam breed interaction as mean weights ranged from 33.1 ± 2.2 kg for BRxSP to 25.6 ± 2.5 kg for SPxBR. The ratio of litter weight to dam weight at weaning was greater (P < 0.01) for SP than for BR dams (71 vs 58 ± 3%), KK were intermediate (66%). Preweaning ADG and adjusted weaning weights were lower (P < 0.01) for kids of SP dams (161.5 ± 4.1 g/d, 14.81 ± 0.37 kg) compared with kids of BR (176.1 ± 4.3 g/d, 15.95 ± 0.38 kg) and KK dams (184.1 ± 4.4 g/d, 16.70 ± 0.39 kg). Kid attrition rate was higher (P < 0.01) for BR dams (38%) compared with KK and SP dams (8%). As measures of whole herd reproductive performance, kid crop percent and adjusted litter weight per doe exposed were lower (P < 0.01) for BR does (138 ± 13%, 22.33 ± 1.98 kg) compared with KK (183 ± 14%, 32.09 ± 2.13 kg) and SP does (191 ± 12%, 27.51 ± 1.89 kg). Results suggest that meat goat breeds differ for doe-kid performance under southeastern US conditions.

Key Words: Meat Goats, Breeds, Reproduction

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54   Effect of breed, rearing management, and supplement type on gastrointestinal parasitism in hair sheep lambs. S. Wildeus*[1], J. E. Miller[2], and J. R. Collins[1], [1]*Virginia State Univeristy*, [2]*Louisiana State University*.

Seventy-two, 4-mo old, mixed-sex Barbados Blackbelly (BB), Katahdin (KA), and St. Croix (SC) hair sheep lambs, were allocated to the experiment in April. Lambs were allocated to either a pasture or pen feeding group balanced by breed and sex, and dewormed (moxidectin; 1 ml/10 kg orally). Both groups received a corn/soybean meal supplement at 1.5% BW, providing either 12 or 18% CP. Pasture animals grazed a naturally parasite-infected, pre-dominantly fescue pasture, subdivided into 2 units (0.8 ha each) for supplement feeding. Pen animals were housed in 6 semi-enclosed pens, with (3 pens per supplement type), and were fed chopped moderate-quality grass hay *ad lib*. BW, fecal egg counts (FEC) and packed blood cell volume (PCV) were recorded in 14-d intervals throughout the trial. Lambs remained on trial until mid-October

(180 d), when all wether lambs were slaughtered, and total worm burden was determined. Data was analyzed for the effects of breed, rearing management, and supplement type. Mean FEC was higher in pasture- than pen-reared animals (P<0.05; 238 vs. 198 eggs/g), but fluctuated throughout the grazing season. Differences between breeds were primarily associated with a reduced FEC in pen-reared BB (P<0.01). Protein supplementation reduced FEC in pens (148 eggs/g), but not on pasture (247 eggs/g), with no effect from energy supplementation (rearing management x supplement types interaction: P<0.05). Mean PCV was higher in BB and SC, than in KA (P<0.05; 31.1, 31.5 and 29.3%, respectively), and was higher in pen- than pasture-reared animals (P<0.05; 32.0 vs 29.3%). Abomasal *Haemonchus contortus* stage 4 larvae and adult worms were lower in pen- than pasture-reared lambs at the end of the grazing season (P<0.01; 112 vs. 310), with no significant differences between breeds. Findings suggest that the native Caribbean breeds (BB and SC) maintained higher PCVs in response to parasite challenge than the improved KA, regardless of management system.

Key Words: Hair Sheep, Parasites, Pasture

55   The use of copper oxide wire particles (COWP) in pregnant ewes. J. Burke*[1] and J. Miller[2], [1]*USDA, Agricultural Research Service,* [2]*School of Veterinary Medicine, Louisiana State University.*

The objective was to determine the effectiveness of COWP in pregnant ewes and safety to lambs. A low dose COWP (#8804 4 g) used in Arkansas has been used in lambs without clinical signs of copper toxicity. Use in pregnant ewes has not been examined. Mature Katahdin ewes were administered 0, 2, or 4 (n = 15/group) g COWP 33 d before lambing in March 2004. Fecal egg counts (FEC) and packed cell volume (PCV) were determined between Days 0 (d of COWP administration) and 35. Lambs were weighed within 24 h after birth, at 30 and 60 d of age, and in mid-September (120 d of age). Plasma was collected from lambs within 24 h after birth and at 30 d of age for determination of aspartate aminotransferase (AST). Within 7 d after COWP, FEC decreased by 1308 and 511 eggs/g (epg) in the 2 and 4 g group compared with an increase of 996 epg in the control group (P < 0.02). There was no change in PCV among groups between Days 0 and 35. Number of lambs born per ewe tended to be greater in COWP compared with control ewes (0 g, 1.42; 2 g, 1.79; 4 g, 1.73 ± 0.13 lambs/ewe; P < 0.10). Birth weights decreased with increasing COWP (0 g, 4.4; 2 g, 4.0; 4 g, 3.7 ± 0.14 kg; P < 0.003). By 30 (0 g, 13.7 ± 0.51; 2 g, 11.8 ± 0.38; 4 g, 11.2 ± 0.34 kg; COWP × birth type, P < 0.02) and 60 (0 g, 20.3 ± 0.84; 2 g, 16.6 ± 0.63; 4 g, 16.9 ± 0.56 kg; COWP × birth type, P < 0.02) d of age, weight of twin-born lambs decreased with increasing COWP. In mid-September weights of twin-born lambs from ewes treated with 4 g COWP tended to be lightest compared with lambs from ewes treated with 0 or 2 g COWP or single-born lambs (P < 0.10). At birth lamb plasma AST increased with increasing dose of COWP in dams (0 g, 55.8; 2 g, 78.0; 4 g, 108.3 ± 9.1 U/L; P < 0.001). At 30 d of age plasma AST was slightly greater in lambs from ewes treated with 4 g COWP (0 g, 56.3; 2 g, 54.2; 4 g, 64.3 ± 2.5 U/L; P < 0.02). Lamb survival to 30, 60, or 120 d of age was not affected by COWP treatment to ewes. Administration of 4 g COWP to late pregnant ewes may negatively impact twin-born offspring.

Key Words: Copper, Ewes, Haemonchus Contortus

56   Interaction between copper oxide wire particles (COWP) and *Duddingtonia flagrans* in hair breed lambs. J. Burke*[1], J. Miller[2], M. Larsen[3], and T. Terrill[4], [1]*USDA, Agricultural Research Service,* [2]*School of Veterinary Medicine, Louisiana State University,* [3]*The Royal Veterinary and Agricultural University,* [4]*Agricultural Research Station, Fort Valley State University.*

The objective was to determine if COWP had any effect on the activity of the nematode-trapping fungus *D. flagrans* in growing lambs. *D. flagrans* has been used to control free-living stages of parasitic nematodes in livestock. Katahdin and Dorper lambs, 4 mo of age, were administered 0 or 4 (n = 24/dose) g COWP in early October 2003. *Haemonchus contortus* was the predominant gastrointestinal parasite during the trial. Lambs from each group were supplemented with corn/soybean meal half with and half without *D. flagrans* for 35 d. Fecal egg counts (FEC) and packed cell volume (PCV) were determined weekly between Days 0 (d of COWP administration) and 35. Feces from each of the four groups were pooled and three replicates were cultured for 14 d at room temperature. L3 larvae were identified and counted per g of feces cultured. Data were analyzed by mixed procedures (SAS) with repeated measures and FEC and number of larvae hatched was log transformed. COWP decreased FEC from more than 5,000 eggs/g (epg) to 250 epg within 7 d and FEC remained lower than lambs not treated with COWP. FEC of lambs fed fungus without COWP were lower on Days 7 and 14 than those not fed fungus (COWP × fungus × day, P < 0.004). PCV of lambs treated with COWP was greater than those not treated between Days 14 and 35 (COWP × day, P < 0.001). Number of larvae hatched was decreased in feces from lambs treated with COWP and fungus between Days 14 and 35 (COWP × fungus × day, P < 0.002). Percentage of larvae identified as *H. contortus* decreased in feces collected from lambs treated with COWP and fungus between Days 14 and 28 compared with other treatments (COWP × fungus × day, P < 0.05). Other trichostrongyles comprised less than 7% in feces collected from control lambs. There was no adverse effect of COWP on the ability of *D. flagrans* to trap residual larvae after COWP treatment. There was a beneficial effect of treating lambs with both COWP and fungus. Fewer eggs hatched leads to fewer larvae on pasture.

Key Words: Copper, *Duddingtonia flagrans*, *Haemonchus contortus*

57   Effect of 0.5, 1.0 and 1.5 gram copper oxide wire particles on natural infection in lambs. J. Miller[1], J. Burke[2], and T. Terrill*[3], [1]*Louisiana State University,* [2]*USDA ARS Booneville,* [3]*Fort Valley State University.*

Copper oxide wire particles (COWP), administered as 2, 4 and 6 g boluses, have been shown to reduce *Haemonchus contortus* burden in lambs. The use of copper in sheep must be cautious as accumulation in the liver can lead to toxicity resulting in production losses and even death. Liver copper levels, at the above doses, were within normal limits but increased with dosage. With the possibility that multiple treatments might be administered during the infection season, this study was conducted to evaluate even lower doses (0.5, 1.0 and 1 g) on infection level. Thirty-two naturally infected lambs were randomly allocated, based on FEC, to one of four treatment groups (eight animals each): Group 1) Control; Group 2) 0.5 g COWP; Group 3) 1.0 g COWP and Group 4) 1.5 g COWP. All animals were maintained on pasture. FEC and PCV were monitored weekly for four weeks after administration. FEC and PCV data were subjected to repeated measures analyzed as a split plot arrangement of treatments using SAS GLM. At one week post-treatment, for Groups 2, 3 and 4, respectively, FEC was reduced by 75%, 58% and 70% compared to Group 1 (P < 0.05). FEC reduction peaked at week two with 90%, 84% and 91%, respectively (P < 0.05). By four weeks, FEC reduction had decreased to 74%, 53% and 76%, respectively (P < 0.05). It should be noted that one animal in Group 3 did not respond to treatment, and if removed, results would have been comparable to Groups 2 and 4. PCV remained relatively constant in Group 1 and increased through week 3 for the other three groups (P < 0.05). By week 4, PCV decreased in all groups, but the relative difference between Group 1 and the other three groups remained consistent. For all time periods subsequent to week 0, FEC and PCV of Groups 2, 3 and 4 were significantly (P < 0.05) lower and higher, respectively, than Group 1. COWP x week interaction for FEC was significant (P < 0.05). *H. contortus* was the most prevalent nematode in fecal cultures. Results indicated that all three dosages were relatively equivalent in their effect on FEC and PCV; therefore, a COWP dosage of 0.5 g appears to be adequate to control infection for at least a period of four weeks.

Key Words: Sheep, Nematode, Copper

58   Effect of the condensed tannin containing forage, sericea lespedeza, fed as hay, on natural and experimental challenge infection in lambs. K. Lange[1], D. Olcott[1], J. Miller*[1], J. Mosjidis[2], T. Terrill[3], and J. Burke[4], [1]*Louisiana State University,* [2]*Auburn University,* [3]*Fort Valley State University,* [4]*USDA ARS Booneville.*

Condensed tannin (CT) containing forages and CT extracts mixed in processed feeds have been shown to reduce fecal egg count (FEC) in sheep, with the major effect on small intestinal nematodes. This study was conducted to evaluate the effect of the CT containing forage, sericea lespedeza (SL), fed as hay, on primarily *Haemonchus contortus* infection. Twenty-eight naturally infected lambs were removed from pasture

and maintained in cement floored pens. Lambs were randomly allocated, based on FEC, to one of four treatment groups (seven animals each): Group 1) natural infection control and fed bermudagrass hay; Group 2) dewormed (experimental infection control) and fed bermudagrass hay; Group 3) natural infection and fed SL hay; Group 4) dewormed and fed SL hay. All animals were fed a concentrate supplement ration at 227 g/hd/d. Groups 2 and 4 were dewormed with levamisole and albendazole. Both bermudagrass and SL hay were fed free choice. All animals received trickle infections of a mixed larval inoculum of 1000 L3 (97% *H. contortus*) three times a week for the first three weeks of the trial. Feces from each treatment group were cultured for recovery of L3. SL hay feeding was stopped after seven weeks and monitoring continued for another two weeks. FEC and PCV data were subjected to repeated measures analyzed as a split plot arrangement of treatments using SAS GLM. The FEC for both Groups 3 and 4 was significantly (P < 0.05) reduced by >75% through week seven. After SL hay feeding stopped, FEC reduction dropped substantially to 35-50%, which was still a significant (P < 0.05) reduction. PCV tended to remain higher in the SL hay fed groups, and the differences were significant (P < 0.05) for Group 3 but not significant (P > 0.05) for Group 4. SL hay x week interaction for FEC was significant (P < 0.05). *H. contortus* was the most prevalent nematode in fecal cultures. Results indicated that SL, fed as hay, effectively reduced the number of eggs (primarily *H. contortus*) shed in feces. That FEC increased after SL hay feeding stopped, indicated that the effect was partially on nematode fecundity.

Key Words: Sheep, Nematode, Sericea lespedeza

59   Preharvest spray washing of goats: effects on stress responses and bacterial counts on skin and carcass surfaces. A. J. Hagerman*, G. Kannan, K. R. Eega, B. Kouakou, and G. W. McCommon, *Fort Valley State University*.

Preslaughter management methods that decrease fecal contamination of skin/hide are likely to reduce biological hazards during slaughter and processing. This experiment was conducted to determine the effects of preslaughter spray washing on stress responses and skin and carcass bacterial counts in goats. In a Randomized Complete Block Design, twenty meat goats were slaughtered in two groups (replicate) on two different days (10 goats/replicate). Animals were randomly allotted to treatment (spray wash) or control (no wash) groups (n = 5/treatment/replicate). Blood samples were collected by jugular venipuncture and skin swab samples were collected from a hind leg from each animal in the holding pen. Spray washing of individual animals was done in the single file race for a period of 1 min. Swab samples were collected again from control and treated animals prior to stunning (10 min after the washing treatment), and blood samples were collected during exsanguination. Bacterial counts on carcasses immediately after dressing were determined. Treatment, sampling time, or treatment × sampling time did not influence (P > 0.05) plasma cortisol, glucose, and non-esterified fatty acid (NEFA) concentrations. The counts were the same in both treated and control groups prior to washing treatment, but were significantly less in the treated group when sampled after washing (treatment × sampling time, P < 0.05). Total plate counts were 3.5 and 4.2 $\log_{10}CFU/cm^2$ in treated and control groups, respectively. A similar effect was noticed in the skin aerobic plate counts (treatment × sampling time, P < 0.05) also. Aerobic plate counts were 3.6 and 4.4 $\log_{10}CFU/cm^2$ in treated and control groups, respectively. However, skin *E. coli* counts did not significantly decrease (P > 0.05) due to spray washing treatment. Spray washing treatment also did not influence (P > 0.05) carcass E. coli counts, total plate counts, or aerobic plate counts. The results indicate that skin bacterial counts can be significantly reduced by preslaughter spray washing, without increasing stress in goats.

Key Words: Goats, Stress, E. Coli

60   Effects of breed and carcass electrical stimulation on meat quality characteristics in goats. K. M. Gadiyaram*[1], G. Kannan[1], S. Galipalli[1], T. D. Pringle[2], and K. W. McMillin[3], [1]*Fort Valley State University,* [2]*The University of Georgia,* [3]*Louisiana State University AgCenter*.

Electrical stimulation (ES) improves meat quality by preventing cold-induced shortening in carcasses, but its effects have not been studied adequately in goats. This study was conducted to determine the effects of postmortem ES on meat quality in two breeds of goats. Uncastrated

Spanish and Boer × Spanish × Kiko (n = 10/breed, body weight 31.15 ± 2.43 kg) kid goats were slaughtered in two replicates over a period of 7 d. Immediately after slaughter each carcass was split into two halves along the vertebral column. The left half was subjected to a high voltage ES (580 v) for a period of 120 s (Treatment) and right half was unstimulated (Control). The pH values, recorded at 0, 3, 6, 9, 12, 15, 18, and at 24 h post-stimulation, were lower in treated sides compared with control sides (P < 0.01), particularly during the hours immediately after ES. Treatment had no effect on the temperature decline (P > 0.05). Longissimus muscle glycogen concentrations immediately after ES were significantly less (P < 0.05) in treated sides compared with control sides. The Warner-Bratzler shear force (WBSF) values of loin chops decreased (P < 0.01) due to ES, although aging time (day 1 and 4) and breed had no effect on WBSF values (P < 0.05). Cooking loss, color, and heated calpastatin activity were not affected by ES (P > 0.05), but calpastatin activities decreased after 4 days of aging (P < 0.05). There were no significant effects of treatment and aging time on selected myofibrillar proteins studied (myosin heavy chain, myomesin, desmin, actin, troponin-T, and myosin light chain, P > 0.05). However, desmin concentration tended to decrease after 4 days of aging (P = 0.08). The results indicated that goat meat tenderness can be improved using ES.

Key Words: Goat Meat, Electrical Stimulation, Tenderness

61   Carcass traits and meat quality of pasture-raised Katahdin crossbred lambs. D. J. Jackson*[1], N. C. Whitley[1], J. W. Lemaster[2], and S. Schoenian[2,3], [1]*University of Maryland Eastern Shore,* [2]*Maryland Cooperative Extension,* [3]*WMREC*.

To compare carcass traits and meat quality of pasture-raised Katahdin crossbred lambs sired by Texel, White Dorper, or Suffolk rams (n=1/sire), fifty-eight lambs at 96±0.8 d of age were used. Lambs were weaned and raised on pasture until finishing (backfat depth over the loin of at least 3.9 mm determined via ultrasound measurement between the 12th-13th rib). At 167±0.7 d of age, 5 finished lambs/breed type were slaughtered and carcass data collected. Sensory analysis, shear force and color measurements were conducted on longissimus thoracis samples. Pluck weights (1.4±0.04 kg) and empty digestive tract weights (3.8±0.1 kg) were similar among the breed crosses. Body conformation scores and quality grades were higher for both Texel- and Dorper-sired lambs compared to Suffolk-sired lambs. Actual carcass backfat depth over the loin was similar among the three breeds, averaging 5.4±0.2 mm. Cold carcass weight and loin eye area were similar among the groups and averaged 15.0±0.4 kg and 4.9±3.4 cm^2 , respectively. Leg circumference was greater (P<0.04) in Suffolk- (77.5±0.8 cm) compared to Dorper-sired lambs (74.4±0.8 cm), while Texel-sired lambs (75.4±0.8 cm) were intermediate. In addition, Suffolk-sired lambs had longer (P<0.01) carcasses (102.7±1.5 cm) than Texel- (94.3±1.5 cm) and Dorper-sired lambs (95.8±1.5 cm). However, primal cut weights (neck, shoulder, breast, rib, loin, leg, and shank sections) were not influenced by sire breed. Loin color and sensory panel tenderness, juiciness and off-flavor detection scores were similar among the breed groups. Loins from Texel-sired lambs (2.2±0.1 kg/cm^2) had a higher (P<0.01) shear force measurement than those from Dorper-sired lambs (1.8±0.1 kg/cm^2) while loins from Suffolk-sired lambs were intermediate (2.0±0.12 kg/cm^2). In conclusion, when mated to Katahdin ewes, Dorper and Texel sires produced lambs in a forage-based finishing system with higher quality carcasses than Suffolk-sired lambs.

Key Words: Lambs, Carcass, Katahdin

62   Demographic factors influencing consumer preference of chevon products. G. Kannan*[1], M. C. Nelson[1], T. E. Hollis[1], T. D. Pringle[2], and K. W. McMillin[3], [1]*Fort Valley State University,* [2]*The University of Georgia,* [3]*Louisiana State University AgCenter*.

Chevon consumption in the US has increased in recent years and demand is primarily among the ethnic populations. The purpose of these trials was to determine differences in the preferences for chevon products among different consumer groups. Three consumer preference trials were conducted during the Sunbelt Expo 2001, 2002, and 2003 at Moultrie, Georgia. In the first trial, cooked shredded chevon samples with and without barbecue sauce were evaluated on a nine-point scale by 120 consumers. Chevon with barbecue sauce received higher acceptability

scores than chevon with no sauce. Consumers who had eaten chevon previously gave higher scores ($P < 0.05$) to the products than those who had not tasted chevon previously. Consumer race or ethnicity did not influence the scores. In the second trial, low-fat chevon and beef sausages were compared for tenderness, juiciness, taste, and aroma on a nine-point scale. The scores were not significantly different for the two sausage types. Consumer race, sex, age, education, income, or prior experience eating chevon did not influence their perceptions of chevon products. Consumers who were willing to purchase chevon gave higher ($P < 0.05$) taste scores for chevon sausages than those who are not willing to purchase chevon. In the third trial, smoked and fresh low-fat chevon sausages were compared. Consumers with prior experience eating chevon gave higher ($P < 0.05$) aroma scores to both types of chevon sausages compared to those who tasted chevon for the first time. Higher ($P < 0.05$) tenderness, juiciness, taste, and aroma scores were given by consumers who were willing to purchase chevon than by consumers not willing to purchase chevon. The results indicated that prior experience and willingness to purchase goat meat from a supermarket are the main factors that influence consumer preference scores for chevon products.

Key Words: Chevon, Consumer Preference, Demographics

63   Objective and subjective evaluations of value-added chevon and beef products. K. R. Eega*[1], K. M. Gadiyaram[1], G. Kannan[1], V. R. Gutta[1], T. D. Pringle[2], and K. W. McMillin[3], [1]*Fort Valley State University,* [2]*The University of Georgia,* [3]*Louisiana State University AgCenter.*

Development of value-added chevon products is expected to expand the already existing demand for chevon in the US. Two experiments were conducted to compare the characteristics of chevon sausage and jerky with those of beef products. In Experiment 1, cooked sausages were prepared with six different lean/fat combinations: 90% chevon lean + 10% chevon fat, 80% chevon lean + 20% chevon fat, 90% chevon lean + 10% beef fat, 80% chevon lean + 20% beef fat, 90% beef lean + 10% beef fat, and 80% beef lean + 20% beef fat. Texture profile analysis (TPA) revealed that hardness, fracturability, and chewiness values were higher for sausages containing chevon lean compared to beef ($P < 0.01$). Tenderness and juiciness scores given by an eight-member sensory panel were not different for the different lean/fat combinations; however, flavor scores were highest for sausages with 80% beef + 20% beef fat. Oxidative stability indicated by thiobarbituric acid reactive substances (TBARS) was not different among sausage types. Redness (a*) values were higher ($P < 0.01$) for sausages containing beef lean compared with those containing chevon lean. Protein and moisture contents were higher and fat content lower in 90% lean than 80% lean sausages. In Experiment 2, chevon and beef jerky were prepared under identical conditions using a commercial jerky seasoning. Moisture and ash contents were higher and fat content lower in chevon jerky than beef jerky. The a* values were higher for chevon jerky compared with beef jerky. Sensory scores (tenderness, juiciness, flavor) and TBARS values were not different for the jerky types. In conclusion, chevon products were identical to beef products, based upon subjective evaluations of tenderness and juiciness. Chevon is an acceptable raw material for preparation of low-fat meat products.

Key Words: Chevon, Sausage, Jerky

64   Production of Dorper X St. Croix White and St. Croix White lambs grazing pasture during the wet season in the US Virgin Islands. R. E. Dodson*, A. J. Weis, and R. W. Godfrey, *Agricultural Experiment Station, University of the Virgin Islands.*

St. Croix White (STX; n = 12) and Dorper X STX (DRP; n = 14) lambs were used to evaluate the growth of lambs grazing during the wet season. Two wk after weaning at 63 d of age lambs were placed in guinea grass pastures (0.5 ha) in rotational grazing. Each week weight, fecal egg counts (FEC) and packed cell volume (PCV) were measured. Lambs were slaughtered at a BW of 30 kg. Carcass weight, fat thickness over the 12th rib, rib eye area (REA), percentage kidney-pelvic-heart (KPH) fat and leg circumference were measured. Data were analyzed by SAS procedures. Total rainfall was 1495 mm, forage availability was 1051.0 ± 261.9 kg DM/ha with 11.3 ± 0.7 % crude protein and grazing duration was 18.2 ± 2.0 d/pasture. Days on pasture was lower ($P < 0.03$) for DRP than for STX lambs (184.5 ± 9.3 vs. 216.4 ± 9.9 d, respectively).

Average daily gain was higher ($P < 0.004$) for DRP than for STX lambs (85.7 ± 3.0 vs. 71.8 ± 3.2 g/d, respectively). There was no difference ($P > 0.10$) between DRP and STX lambs in FEC or PCV. Three lambs that died (DRP n = 1; STX n = 2) had low PCV without elevated FEC. Hot carcass weight was different ($P > 0.05$) between DRP and STX lambs (13.7 ± 0.2 vs. 13.1 ± 0.2 kg, respectively). Cold carcass weight was greater ($P > 0.02$) in DRP than STX lambs (13.3 ± 0.2 vs. 12.6 ± 0.2 kg, respectively). The REA was not different ($P > 0.10$) between breeds (9.3 ± 0.3 vs. 9.1 ± 0.3 cm^2 , respectively). Fat thickness was not different ($P > 0.10$) between breeds (1.7 ± 0.1 vs. 1.4 ± 0.1 mm, respectively). The KPH was not different ($P > 0.10$) between breeds (2.2 ± 0.2 vs. 2.7 ± 0.2 %, respectively). Leg circumference of DRP was greater ($P > 0.03$) than STX lambs (37.4 ± 0.3 vs. 36.3 ± 0.3 cm, respectively). Revenue from sales was not different ($P > 0.10$) between DRP and STX lambs ($66.75 ± 0.17 vs. $66.33 ± 0.18 per lamb, respectively). Dorper sired lambs will reach market weight sooner than STX lambs and do not exhibit higher levels of gastrointestinal parasites during the wet season in the US Virgin Islands.

Key Words: Hair Sheep, Grazing, Lambs

65   Effect of feeding regimens on growth, leptin, and carcass composition in meat-type goats raised in Missouri. E. Walker*[1], W. Walker*[1], N. Whitley[2], C. Stahl[3], D. Keisler[3], and E. Berg[3], [1]*Southwest Missouri State Univesity,* [2]*University of Maryland, Eastern Shore,* [3]*University of Missouri.*

The objectives were to determine rate of gain and carcass traits of meat goats raised under pasture or feedlot conditions in Missouri and to determine effects of feeding strategy on carcass composition, meat quality, and circulating concentrations of leptin. Castrated Boer-crossbred kids (n=40;50% Angora or Spanish) weighing 17.64 ± .45 kg were allocated into either confinement (CF) or pasture feeding regimes (PF;d=0) to account for breed type and body weight and a blood sample was collected via jugular venipuncture. At d-10 all kids were dewormed and vaccinated. Beginning at d 0, CF goats were acclimated for 14 d to a commercially available diet containing 16% crude protein. Every 14 d thereafter, all kids were weighed and a blood sample was collected. PF goats were rotated through three 1 ha pastures containing a mixture of native browse, forbs, and grass. At the conclusion of the 103 d feeding period, animals were slaughtered and carcass data collected. CF goats were heavier (30.36 vs 22.41 ± 1.07 kg) and had greater ADG (0.12 vs 0.05 ± 0.006 kg) than PF goats (p < .0001). Carcass length and leg circumference were also greater (p < 0.001) in CF than PF goats. Primal cut (neck, shoulder, breast, rib, longissimus dorsi, and leg) weights, flank streaking scores and adjusted fat were greater (p < 0.05) in CF than PF managed goats. At slaughter, serum concentrations of leptin were greater in CF goats (4.03 ± 0.46 ng·mL^{-1}) than for PF goats (1.64 ± 0.50 ng·mL^{-1}). Dressing percentage for CF goats was greater than PF goats (49.9 vs 46.1 ± 0.57%). In conclusion, CF goats grew faster and produced heavier carcasses with heavier primal cuts, creating the potential for greater economic return to the producer and packer.

Key Words: Goat, Carcass, Leptin

66   Nitrogen fertilizer rates on wheat pastures for goats in north Texas. D. Pawelek*[1], J. P. Muir[1], and B. D. Lambert[1,2], [1]*Texas Agricultural Experiment Station,* [2]*Tarleton State University.*

Wheat (*Triticum aestivum*) pastures are used as cool-season forages to complement range-based goat production in Texas. Because goats are more selective than cattle, ideal nitrogen (N) fertilizer rates recommended for wheat grazed by cattle may differ for goats. Average daily gains (ADG) of Boer × Spanish doe kids (17 kg) as well as forage yields and crude protein (CP) concentrations were measured for two seasons on replicated wheat paddocks fertilized with 0, 56, 112 and 224 kg N/ha each season in split autumn and spring applications at Stephenville, Texas USA. Animals were stocked in the pasture at 4.5 head/ha from January to April of 2003 (478 mm rainfall from September to March) and 2004 (355 mm rainfall). Available forage ranged from 50 kg/ha in January to 200 kg/ha in April in the control paddocks and from 2300 kg/ha in January to 6300 kg/ha in April in the 224 kg N/ha paddocks. Forage CP ranged from 25-34% (0 and 224 kg N/ha paddocks, respectively) in January, down to 13-22% in April. The ADG over the 90-day trials were the same (year × treatment P>0.05) both years: 68 g/kid

for the 0 N treatment, 24% less (P<0.05) than the animals on fertilized paddocks which all gained near 90 g/kid. Fertilizer N rates over 56 kg/ha/season did not increase ADG/kid, but may increase ADG/ha if stocking rates were adjusted for forage production.

67   Preference of grazing goats for cool-season annual clovers. T. H. Terrill*[1], W. F. Whitehead[1], B. P. Singh[1], S. Gelaye[1], G. Durham[2], and C. S. Hoveland[2], [1]*Fort Valley State University,* [2]*The University of Georgia.*

Information on improved forages for goat grazing systems is lacking for the southeastern USA. Two cafeteria-style grazing trials were completed to determine preference of meat-type goats for cool-season annual clovers in the lower Piedmont-upper Coastal Plain region of Georgia. In experiment 1, 8 replicates of 6 plots (3.05 m x 3.05 m) of various clover cultivars were established in November 1999. After establishment, each replicate of 6 plots was individually fenced and grazed for 48 hours by 4 mature Spanish does (total 32 animals) over 2 grazing periods in March and April 2000. Forage preference was determined after 4, 24, and 48 hours grazing during each period using a 1-10 ocular preference scoring system (1=no grazing and 10=completely grazed). In experiment 1, Dixie[TM] and AU Robin[TM] crimson clover (*Trifolium incarnatum* L.) were most preferred, AU Sunrise[TM] crimson clover and Yuchi[TM] arrowleaf clover (*Trifolium vesiculosum* Savi) were intermediate, and Segrest[TM] ball clover (*Trifolium nigrescens* Viv.) and R18' rose clover (*Trifolium hirtum* All.) were least preferred. Forage preference was not influenced by DM yield, fiber content, or protein concentration. In experiment 2, Dixie and AU Sunrise crimson clover were most preferred in the first cutting, 3 arrowleaf clover types and Americus[TM] hairy vetch (*Vicia villosa* Roth) were intermediate, and R18 rose clover was least preferred. When the crimson clover plots were not available for the second grazing period, the goats most preferred Yuchi arrowleaf clover, with BYMV arrowleaf clover and hairy vetch intermediate, and rose clover least preferred. Crimson clover appears to be a useful forage for winter-spring grazing of goats in the southeastern USA.

68   Performance by goats and sheep consuming a 65% concentrate diet subsequent to co-grazing of grass/forb pastures at different stocking rates. G. Animut*[1,2], A. L. Goetsch[1], G. E. Aiken[3], R. Puchala[1], G. Detweiler[1], C. R. Krehbiel[2], R. C. Merkel[1], T. Sahlu[1], L. J. Dawson[4], and Z. B. Johnson[5], [1]*E (Kika) de la Garza American Institute for Goat Research, Langston University,* [2]*Animal Science Department, Oklahoma State University,* [3]*USDA ARS Dale Bumpers Small Farms Research Center,* [4]*College of Veterinary Medicine, Oklahoma State University,* [5]*Department of Animal Science, University of Arkansas.*

A study was conducted to determine effects of co-grazing of mixed grass/forb pastures at three stocking rates (SR) on subsequent performance of goats and sheep consuming a 65% concentrate diet. Experimental periods, in 2002 and 2003, were 15 wk in length, following 16 wk of grazing. Sheep (Katahdin) and goats (#880575% Boer) were 4 to 5 mo of age when grazing began. Stocking rates were four (4), six (6), and eight (8) animals per 0.4-ha pasture, with equal numbers of sheep and goats and three pastures per SR. Two sheep and two goats from each pasture were used in this subsequent confinement period, with initial BW of 23 ± 2.7 and 25 ± 3.6 kg, respectively. ADG by all animals during grazing tended to decrease linearly (P < 0.10) with increasing SR (53, 44, and 41 g for 4, 6, and 8, respectively). In the period after grazing, DMI was affected (P < 0.05) by year x SR (yr 1: 958, 955, and 1,011g/d; yr 2: 1,109, 904, and 931 g/d for 4, 6, and 8, respectively (SE = 49.6)) and species x year (P< 0.06) interactions (yr 1: 1,105 and 844; yr 2: 1,164 and 799 g/d for sheep and goats, respectively (SE = 40.5)). ADG was unaffected by SR (P > 0.10; 183, 153, and 159 g for 4, 6, and 8, respectively (SE = 8.3)) but was greater (P < 0.05) for sheep vs goats (193 vs 137 g; SE = 8.1). Gain efficiency (ADG:DMI) was not influenced by treatments. Energy expenditure (EE), measured twice via heart rate, tended to increase linearly (P < 0.07) with increasing SR (562, 592, and 628 kJ/kg BW$^{0.75}$ for 4, 6, and 8, respectively; SE = 15.9). Body composition at the beginning and end of this period, measured from shrunk BW and urea space, was not impacted by SR. In conclusion, ADG by neither sheep nor goats consuming a 65% concentrate diet compensated for the effect of SR in a previous grazing period,

which may involve effect of prior SR on subsequent EE. This project was supported by USDA Project Number 99-38814-9502.

69   Growth performance of weaned fallow deer fawns (*Dama dama*) is unaffected by Cattle-Ase[TM] supplementation. L. Jonovich*, S. Mapel, D. Neuendorff, A. Lewis, and R. Randel, *Texas Agricultural Experiment Station.*

The effect of Cattle-Ase[TM], a fibrolytic enzyme, (Loveland Industries Inc., Greeley, CO) supplementation on growth performance was studied in fallow deer fawns (*Dama dama*). At weaning, fawns were allotted to either a control (Con) or Cattle-Ase[TM] (Ase) ration (n = 13 females and n = 17 males/treatment). The animals were maintained in 4 0.2 hectare pastures (2 replicates/treatment, 1 replicate/pasture, n = 15/replicate) with Coastal bermudagrass hay, water, and minerals available free choice. The ration contained a mixture of 1:1 corn and soybean meal fed at 2% of BW. Animals were weighed and ration quantity was calculated beginning on 9/24/2003. Weights and ration adjustments were then made on days 28, 55, 83, 110, 137, 167, 200, and ending on day 283 of supplementation. The Cattle-Ase[TM] supplementation was at a rate of 185 g/ton of ration on a DM basis. Repeated measures analysis of BW was conducted using MIXED models procedures of SAS. ADG and antler growth of males, in terms of length and weight, were analyzed using GLM procedures of SAS. Treatment did not affect body weight during the trial (P = 0.99), however, time did influence BW (P < 0.01). ADG was also not affected by treatment (Con: 85.93 ± 3.79 g, Ase: 81.74 ± 3.63 g, P = 0.17). BW in males, however, was greater than females at the beginning (male: 23.22 ± 0.51 kg, female: 19.83 ± 0.55 kg, P < 0.01) and at the end of the trial (male: 50.39 ± 0.85 kg, female: 38.09 ± 0.62 kg, P < 0.01), regardless of treatment. ADG also differed between sexes (male: 98.38 ± 2.45 g, female: 65.92 ± 1.57 g, P < 0.01). Treatment did not affect mean antler weight (Con: 25.58 ± 2.35 g, Ase: 32.21 ± 3.59 g, P = 0.14) nor did it affect mean antler length (Con: 14.38 ± 0.77 cm, Ase: 16.42 ± 0.99 cm, P = 0.12). Overall, growth performance of fallow deer fawns was unaffected by Cattle-Ase[TM] supplementation.

70   Energy utilization by lactating Alpine goats: dietary concentrate level and stage of lactation. I. Tovar-Luna[1], A. L. Goetsch*[1], R. Puchala[1], T. Sahlu[1], S. P. Hart[1], and Z. B. Johnson[2], [1]*E (Kika) de la Garza Institute for Goat Research, Langston University,* [2]*Department of Animal Science, University of Arkansas.*

Twenty-four lactating and 13 nonlactating Alpine does were used to determine effects of stage of lactation and dietary concentrate level on energy utilization. Sixty and 20% concentrate diets (HE and LE, respectively; total mixed rations) were consumed ad libitum by lactating does and at a level of intake near maintenance by nonlactating animals. Fecal and urine collections and respiration calorimetry were used to determine ME intake and energy expenditure. ME intake by lactating does was affected (P < 0.05) by an interaction between stage of lactation and diet (HE: 17.1, 20.0, and 17.9 MJ/d; LE: 17.9, 16.2, and 14.1 MJ/d for early, mid-, and late lactation, respectively (SE = 1.20)). Total milk energy yield decreased (P < 0.05) with advancing stage of lactation (7.04, 6.26, and 4.39 MJ/d for early, mid-, and late lactation, respectively; SE = 0.417) and was greater for HE vs LE (6.86 vs 4.94 MJ/d; SE = 0.509). Milk energy from the diet was similar between diets in early lactation but numerically greater in mid- and late lactation for HE than for LE (HE: 4.68, 6.31, and 5.02 MJ/d; LE: 4.88, 3.63, and 2.35 MJ/d for early, mid-, and late lactation, respectively (SE = 0.801)). The efficiency of ME utilization for maintenance based on data from nonlactating does was similar between diets and ranked (P < 0.05) mid- > early > late lactation (0.67, 0.71, and 0.61 for early, mid-, and late lactation, respectively; SE = 0.017). The efficiency of use of dietary ME for lactation (k_{l-d}) was not influenced by stage of lactation and was greater (P < 0.05) for HE than for LE (0.63 vs 0.55; SE = 0.034). In conclusion, k_{l-d} by lactating goats appears to be influenced by metabolizability of the diet similarly regardless of stage of lactation. This project was supported by USDA Project Number 99-38814-9500.

71   The relationship between heart rate and energy expenditure in growing crossbred Boer and Spanish wethers. R. Puchala*, I. Tovar-Luna, A. L. Goetsch, and T. Sahlu, *E (Kika) de la Garza American Institute for Goat Research.*

Eight Boer (75%) x Spanish (BS) and eight Spanish (S) wether goats (155 ± 8 d of age and 19.2 ± 2.3 kg BW, initial) were used to determine effects of genotype, diet, and time of the day on energy expenditure (EE), heart rate (HR), and the EE:HR ratio with ad libitum, maintenance, and fasting levels of feed intake. Diets were 65% concentrate (13.8% CP, DM basis) and coarsely ground alfalfa hay (18.5% CP). EE was determined by respiration calorimetry, expressed relative to average BW within the 2-d measurement periods, and HR was measured using Polar S610 monitors. EE ranked (P < 0.05) ad libitum > maintenance > fasting (499, 392, and 270 kJ/kg $BW^{0.75}$), and differences (P < 0.05) in HR were similar (95.8, 71.5, and 54.2 beats/min, respectively). However, EE:HR was highest among levels of intake (P < 0.05) for maintenance (5.09, 5.61, and 5.31 kJ/kg $BW^{0.75}$ per heart beat for ad libitum, maintenance, and fasting, respectively). Diet had no effects at any level of intake. EE with ad libitum intake was similar between breeds (499 and 500 kJ/kg $BW^{0.75}$ for S and BS), but HR tended to be higher (P < 0.07) for S vs BS goats (99.2 vs 91.9 beats/min), therefore, EE:HR was higher (P < 0.05) for BS vs S (5.57 vs. 5.07 kJ/kg $BW^{0.75}$ per heart beat). Hour of the day affected EE, HR, and EE:HR at all levels of intake (P < 0.05). With ad libitum and maintenance intake, EE was highest during and after meals at 0800 and 1600. Conversely, EE during fasting was only higher during daytime hours (0800 to 2000) than at night. For ad libitum, maintenance, and fasting intake, the highest EE:HR ratio was at 1600 (5.60, 6.00, and 5.58 kJ/kg $BW^{0.75}$ per heart beat, respectively). The lowest EE:HR ratio for ad libitum and maintenance intake was at 0700 (4.93 and 5.25 kJ/kg $BW^{0.75}$ per heart beat, respectively), whereas during fasting the lowest value (4.69 kJ/kg $BW^{0.75}$ per heart beat) was at 1000. In conclusion, for use of HR to predict EE, it appears desirable to determine the ratio of EE:HR over an extended period of time with a level of intake similar to that during prediction. This project was supported by USDA Project Number 99-38814-9500.

Key Words: Energy Expenditure, Goats, Heart Rate

72   Evaluating the relationship between temperament and production traits of hair sheep. V. McSween*, R. W. Godfrey, R. E. Dodson, and A. J. Weis, *Agricultural Experiment Station, University of the Virgin Islands.*

In cattle it has been reported that temperament score (TS) and chute exit velocity (EV) are related to each other and various production traits. The objectives of this experiment were to analyze the relationship between TS (1 = calm, no movement to 5 = highly agitated), EV (m/s) and ADG in young lambs and pregnancy in adult ewes. Exit velocity was measured using electric timers 101.6 cm apart just past the exit of the chute. Lambs (St. Croix White, STX n = 20; Barbados Blackbelly, BB n = 35; Dorper X St. Croix White, DRPX n = 24) weaned at 63 d of age were evaluated 64 ± 0.6 d after weaning. Pregnant STX ewes (n = 25) were evaluated at 12.5 ± 1.2 d before and 13.5 ± 0.5 d after lambing. Data were analyzed using GLM procedures of SAS. The STX lambs had a lower EV (P < 0.02) than either BB or DRPX lambs (1.34 ± 0.21 vs. 1.99 ± 0.16 vs. 2.02 ± .021 m/sec, respectively). There was

no difference (P > 0.10) in TS of lambs among breeds. Ewe lambs had higher (P < 0.05) EV and TS than ram lambs. Lambs with TS of 1 had a lower EV (P < 0.05) than lambs with TS of 2 or 3. Lambs with TS of 1 or 2 had higher weaning weights (P < 0.02) than lambs with TS of 3. Lambs with TS of 1 had higher ADG at 30 d after weaning (P < 0.04) than lambs with TS of 2 or 3 but there was no difference (P > 0.10) at 70 d. Temperament score of pregnant ewes was not different (P > 0.10) than that of non-pregnant ewes (1.16 ± 0.09 vs. 1.26 ± 0.09, respectively). Exit velocity of pregnant ewes was greater (P < 0.002) than that of non-pregnant ewes (2.96 ± 0.18 vs. 2.18 ± 0.17, respectively). There was no difference (P > 0.10) in EV of pregnant or non-pregnant ewes based on TS. These results show that TS of young lambs is related to ADG shortly after weaning but not at later times. There was a relationship between TS and EV in young lambs but not in adults. This may be due to the number of times the adult sheep have gone through the chute during their life. This project was partially supported by grant MBRS-RISE 5R25GM061325-04.

Key Words: Sheep, Behavior, Temperament

73   Production and marketing recommendations for profitable goat production in West Virginia. D. Singh-Knights* and M. Knights, *West Virginia University.*

Sales of goat meat (chevron) in the Northeast have increased continuously since the early eighties and are expected to continue. Goat production can become potentially profitable for farmers in the Northeast. Currently, the industry′s profitability is limited by an inadequate year round supply, low prices, and inconsistencies in meeting specific consumer preferences. Understanding the factors affecting regional variations in prices and number of goats sold may enhance revenue generation by goat producers in West Virginia (WV). Goat sales transactions from auction markets in West Virginia for the period 1999-2003 were analyzed to determine the effects of year, month, location, market class and their interactions on goat price and goat sales. Forecasting procedures (SAS/ETS 8.0) were used on the goat price and goat sales series to construct goat price and supply models and to develop forecasts for 2004-2007. Demand for WV goats is seasonal and increases during periods of ethnic holidays. A significantly higher amount of heavier goats than lighter goats were sold annually and monthly during 1999-2003 (Month, Month*Category, Year, Year*Category, P<0.01). Significantly higher prices were received monthly for lighter goats than heavier goats (Month*Category, P<0.01). The results of the prices and sales forecasts suggest continued patterns as above in both goat sales and prices. Consumer preferences are reflected in prices offered for goats in traditional auction markets but the divergence between the value consumers place on weight/carcass quality and the product offering implies failure by producers to receive these price signals or to understand the potential profitability associated with matching product offering to consumer preferences. The need for larger herds and enhanced reproduction and marketing strategies to provide goat products more reliably year round was also identified. The results of this study can be used by individual producers or extension educators to evaluate production and marketing options for goat production. This undertaking will strengthen production and marketing linkages in the goat industry.

Key Words: Goat Industry, Production, Marketing

Extension

74   Results of technology questions as part of Master Cattle Producer Survey. J. B. Neel*, C. D. Lane, W. W. Gill, and A. E. Fisher, *University of Tennessee.*

Tennessee beef producers were surveyed in 2004 as part of the University of Tennessee Master Cattle Producer Program to determine use of technology in their respective beef operation. All data were analyzed using the FREQ procedure of SAS. A total of 157 surveys were completed in meetings across the state, in which 62% were classified as commercial, 13% were purebred and 25% marked both. Approximately 90% of respondents said they either already use or intend to use a computer in their beef operation in the future. No significant differences (P > 0.05) were seen in computer use between age ranges. However, of the respondents that said they would not use a computer, approximately 55%

of them were 60 or older. Seventy-five percent of the people who said they already use a computer are younger than 60. Only 12% of those surveyed did not already have Internet access. Of those that do, 85% said that they would be willing to receive beef production information via the Internet. Computer use on beef cattle farms is significant. The Internet is a valid information delivery system and should be expanded in the future. Future uses of survey results include development of beef cattle educational programs as well as exploring new, creative modes of delivery.

Key Words: Computer Use, Internet, Beef Surveys

75   Cooperative multi-state extension programming; the five state beef initiative. Project development and extension program impacts in Kentucky. L. Meyer*, K. Burdine, and J. Johns, *University of Kentucky*.

Personnel from the Universities of Kentucky, Illinois, Indiana, Michigan and Ohio designed a creative initiative focusing on the entire beef system in 1999. The goal was creation and delivery of a guaranteed quality product through vertical coordination of production and marketing. Funding was obtained through USDA IFAFS. Kentucky efforts focused on a broad level of producer and organizational involvement. Producer certification and cattle tracking and verification systems were implemented. This approach allowed development of a data base of cattle performance; a supply chain of feeder cattle of known quality; and, provided management data to assist individual producers as well as to incorporate into extension programming. A coalition of agencies (Cattlemen's Association, State Department of Agriculture, Farm Bureau and Land Grant University) implemented the project with a producer based Board of Directors. Meetings to provide project information to producers were conducted. An important finding was that the project must work through the conventional marketing system. Order buyer assistance to identify customers for cattle tracking was obtained. During the project, 1561 producers were certified, 10,000 head marketed with carcass data received on 4,010 head. Positive project outcomes were preparation of producers and the marketing segment for source verification and animal ID through EID; incentives for producer BQA certification; improved relations with order buyers and stockyards and demonstration of project value such that additional funding has been obtained through Kentucky Beef Network.

Key Words: Multi-State, Extension Programming, Vertical Coordination

76   Cooperative multi-state extension programming; the five state beef initiative. Carcass data, case studies and pricing scenarios for improving on-farm herd management in Kentucky. K. Burdine*, J. Johns, and L. Meyer, *University of Kentucky*.

The Five State Beef Initiative was a cooperative effort between the states of Kentucky, Illinois, Indiana, Michigan and Ohio. A primary goal of the project was to create a path for producers to capture higher value and profitability for their cattle. In Kentucky, this meant documenting the quality of cattle currently being produced and educating producers for improvement upon that baseline. To accomplish this goal, 10,000 calves from 400 producers in 30 counties were tagged, certified and tracked through the feedyard from fall 2001 to spring 2004. Complete carcass data has been returned on 4,010 head. Quality and yield grade of project cattle improved compared to industry averages. Percent Prime and Choice increased each year (Yr. 1 = 55, Yr. 2 = 67, Yr. 3 = 75). Yield grade and mm of backfat for Yr. 1,2 and 3 were 2.72, 3.22, 2.74, 12.9, 14.4 and 12.1 respectively. Each producer is provided with individual animal data and an explanation to assist in on farm use. Data are also provided to order buyers to assist in marketing of Kentucky feeder cattle. Project results have been presented at 83 county and regional meetings. Case studies have been developed illustrating how genetic factors affect yield grade, impact of limited trait selection on profitability and herd variability on carcass variability and are used in producer educational activities. Grid pricing scenarios were used to quantify differences in calf values and importance of carcass data. These help producers understand why some cattle have huge value discounts and the importance of changing management practices to eliminate these losses.

Key Words: Multi-State, Carcass Data, Profitability

77   Producer education using a cattle feeding profitability prediction contest. J. A. Parish* and W. B. McKinley, *Mississippi State University*.

Over the last 11 years, beef producers from Mississippi, Alabama, and Louisiana have retained ownership through the feedlot of over 6,700 head of cattle in the Mississippi Farm to Feedlot Project. This program allows producers to assess cattle feeding performance and carcass characteristics and identify needed changes in breeding, health, and management programs. As a program enhancement, producers were challenged to predict which three calves in the Mississippi Farm to Feedlot Contest

would be most profitable beyond the farm gate. The purpose of the contest was to: 1) demonstrate the value of information regarding the genetic and profit potential of feeder calves prior to making cattle feeding decisions and 2) stimulate renewed interest in the Mississippi Farm to Feedlot Project and expand the audience reached by this educational effort. Eighty-two percent of contest participants had never consigned cattle to the Farm to Feedlot Project. Initial pay weights and prices in Mississippi the day of shipment along with photographs of 10 randomly selected steers in the 2003-2004 Mississippi Farm to Feedlot Project were provided to contest participants. Cattle were priced on a grid basis using grids representative of market conditions at harvest. Contest participants were asked to predict which three steers would have the highest net returns from feeding and then list the identification numbers of those steers on the contest entry form. Net returns for the contest steers ranged from $210.62 to -136.35$. The percentages of participants selecting the first, second, or third highest ranking steers for net returns were 14.6%, 11.4% and 8.1%, respectively. The contest steer selected by the highest percentage of the participants (20.3%) ranked fifth out of ten for net returns, while the contest steer selected by the lowest percentage of participants (4.1%) ranked tenth out of ten for net returns. Contest results were presented at the annual Mississippi Farm to Feedlot Project wrap-up meeting, and producer feedback indicated that the contest was successful in achieving its objectives.

Key Words: Beef, Performance, Contest

78   Horse Round Table: A unique approach to a one evening program. F. Harper*[1], N. Denton[1], T. Petty[1], K. Hart[1], and S. Jerrell[2], [1] *University of Tennessee*, [2] *Virginia Polytechnic Institute and State University*.

The need for an additional adult horse program format was recognized based on review of the success of a newly created Horse Ownership Course and a long-established Horse Management Course. Program format, logistics and market strategy were focus factors in the initiation of a Horse Round Table by a leadership team of three Extension agents and a horse specialist in East Tennessee. Existing horse programs were all multi-county, multi-evening programs of ten hours of continuing education. The Horse Round Table was developed to meet the requirement for a one-evening program with several current, short topics. A major objective of the Horse Round Table was to have approximately 50 percent of the presentations made by Extension agents. It is imperative that the agents are both subject matter competent and comfortable speaking to a horse audience. The Horse Round Table has four-five talks of 15-20 minute each. Topics are chosen by the leadership team to be current and relevant. The original Horse Round Table in the Knox-Metro area resulted in Extension agents in upper East Tennessee and Southwest Virginia establishing a similar program in 2004. Both Round Tables are multi-county programs and designated as: the Knox-Metro Horse Round Table and the Appalachian Area Horse Round Table. Three such programs have been conducted involving ten Extension agents in leadership team roles and eight agents as speakers. After the presentations, a refreshment break is followed by a question and answer round table. No fee is charged for these programs. Two hundred and thirty-five individuals have attended the three Round Tables and have rated them an average of 4.5 out of a maximum of 5. One hundred percent of the attendees have stated that they would recommend the Round Table to other horse owners, and they would themselves attend another Horse Round Table. Involvement of Extension agents in these teaching roles has received strong support for the Horse Round Table from Extension and District administrators.

Key Words: Horse, Multi-County, Extension

79   Live placing of pigs from discrete categories of a packer value index at the Virginia State Fair Youth Market Hog Show. A. Harper*, C. Wood, M. Estienne, and J. Zhao, *Virginia Polytechnic Institute and State University*.

Market hog projects followed by a competitive hog show continue to be popular animal husbandry education projects for young people in 4-H and FFA. Using data collected at the youth division of the Virginia State Fair Market Hog Show, we tested the hypothesis that the average live class placing of show pigs would be different among discrete categories of a packer value index (PVI) for the packer that purchased the pigs. For two consecutive years, real-time ultrasound measures (ALOKA 500) of

tenth-rib back fat and loin muscle depth were determined on hogs that qualified for the show (2003, n = 87; 2004 n = 83). Using this data, the packer-buyer PVI was calculated for each pig. The data sets from each year were categorized into three similar size groups designated as low (L), medium (M) and high (H) for PVI. The number of entries in weight classes for the shows ranged from 6 to 10. In 2003, PVI category had no impact on live class placing (P = 0.36). Mean live class placing (1=first place) was 5.1 ± 0.5, 4.1 ± 0.4 and 4.6 ± 0.5 for the L, M, and H categories, respectively. Likewise, in 2004 PVI category had no impact on live class placing (P = 0.60). Mean live class placing was 4.5 ± 0.5, 4.1 ± 0.4 and 4.8 ± 0.5 for the L, M, and H categories, respectively. As expected loin muscle depth was greater (P < 0.001) for the higher PVI categories (47 ± 1, 57 ± 1, and 58 ± 1 mm in yr 2003; 55 ± 1, 57 ± 1, and 61 ± 1 mm in yr 2004, for L, M, and H categories, respectively). However, significant back fat differences (P < 0.05) were only observed in 2003 (19 ± 1, 12 ± 1, and 13 ± 1 mm in yr 2003; 15 ± 1, 14 ± 1, and 14 ± 1 mm in yr 2004, for L, M, and H categories, respectively). These data illustrate the difficulty of visual assessment as a consistent predictor of a more complex packer carcass evaluation system. Live show placing is an important component of youth hog shows, but other aspects of the project should also be emphasized by Extension educators working with young people involved in market hog projects.

Key Words: Show Hogs, Carcass Measures, Youth

80 Effect of herd size on production costs and returns for farms enrolled in the Arkansas Beef Improvement, Integrated Resource Management program. J. T. Richeson*, M. S. Gadberry, and T. R. Troxel, *University of Arkansas, Cooperative Extension Service*.

The objective of this study was to evaluate the influence of herd size on direct costs and returns from farms enrolled in the Arkansas Beef Improvement Program (ABIP), an Integrated Resource Management program. Budget data was collected from ABIP farms (n = 25) from 1992 to 2003. Budget items were averaged across years for each farm prior to analysis. Herd size was based on the number of animal units (AU) as of January 1, each year. An AU was based on the metabolizable energy requirement of a 454.54 kg gestating cow, last trimester (7.9 Mcal/kg). The number of AU ranged from 35 to 294. Correlations between AU and budget items were used to determine whether herd size affected productivity (mature cow calf-crop and culling percentage), gross income, direct costs and return over specified costs/AU. Mature cow calf-crop (P = 0.90) and culling percentage (P = 0.19) did not differ with herd size. Kilograms of beef cattle sold/AU (177 ± 10.9 kg) was not correlated (P = 0.23) with herd size. Increased herd size did not affect price per kg of beef cattle sold (P = 0.87) or gross income/AU (P = 0.25) which averaged 72.00 ± 2.27/45.45 kg and 271.82 ± 15.61, respectively. There was no correlation (P > 0.10) between supplemental feed, mineral, vet/medicine, grazing lease, fertilizer and lime, or herbicide expenses and herd size. Purchased hay cost/AU tended (r = -0.38, P = 0.06) to decrease as herd size increased. Average annual direct cost (180.69 ± 13.38/AU) was not correlated (P = 0.36) with herd size. Breakeven price ($29 to $101/45.45 kg) decreased (r = -0.48, P = 0.02) as herd size increased. Return over specified costs increased (r = 0.62, P < 0.01) as herd size increased. Implications suggest that individual income and expenses for larger vs. smaller herds were not different; however, when combined and analyzed as return over specified cost, larger herds were economically advantageous.

Key Words: IRM, Cattle, Budget

81 Preconditioning reduces sickness and death loss in weaned calves. D. Lalman*[1], A. Hutson[1], W. Shearhart[1], C. Ward[1], and S. McKinley[2], [1]*Oklahoma State University*, [2]*Oklahoma Cattlemen's Association*.

The Oklahoma Quality Beef Network (OQBN) is a source and process verification system administered by the Oklahoma Cattleman's Association and supported by the Oklahoma Cooperative Extension Service. The main objective is to encourage producers to uniformly apply best management practices around the time of weaning in order to minimize the risk of sickness and death loss during the stressful weaning and shipping period. The OQBN has also provided coordinated marketing opportunities for OQBN certified cattle through public auction facilities. During the fall of 2003, 1,711 OQBN certified calves representing

45 different sale lots from eight different OQBN sales were tracked for 90 days after the sale event. Each OQBN sale lot buyer was asked to identify one sale lot or management group of non-OQBN-certified cattle (CONTROL). Criteria for selection of CONTROL lots included similar arrival time, origin, weight, gender, and quality compared to OQBN calves. CONTROL lots had little or no available health and management history. Treatment for sickness and death loss was recorded up to 90 days after the sale. Buyers indicated that they paid $8.42 \pm $1.69 per 45.4 kg more for OQBN compared to CONTROL cattle. The incidence of one or more treatments for sickness (PR) and death loss (expressed as mean % of the sale lot or management group) was greater (P<.01) for CONTROL (29.1, 3.0) compared to OQBN certified cattle (6.7, .1). The range in PR was 0 to 74 and 0 to 49 for CONTROL and OQBN cattle, respectively. Management system after the sale was classified as wheat pasture (WP), feed yard (FY), or dry wintering (DW). Only 4 lots were assigned to DW, while 32 and 9 lots of cattle were assigned to WP and FY, respectively. Cattle assigned to FY had greater (P<.01) PR (12.7) compared to cattle assigned to WP (2.1). Cattle assigned to DW were excluded from the analysis due to low experimental units. Management system did not influence (P>.1) death loss. Calves qualifying for OQBN certification had substantially reduced sickness and death loss compared to more traditionally managed calves.

Key Words: Preconditioning, Health, Weaning

82 The effects of method of castration, and/or implantation on cow/calf performance when creep grazing either tall fescue or crabgrass. B. Stewart*[1], S. Gunter[1], P. Beck[1], M. Phillips[1], J. Parrish[2], and T. Troxel[2], [1]*University of Arkansas, SW Research & Extension Center*, [2]*University of Arkansas Cooperative Extension Service*.

This study was designed to evaluate the affects of castration/implantation and creep grazing on pre- and post-weaning calf performance. On June 23, 2003, 120 beef cows (BW = 420 ± 11 kg) and calves (BW = 112 ± 3.8 kg) were weighed, body condition scored (1 to 9 scale; BCS), and returned to 6 previously assigned 4.9 ha bermudagrass pastures. Bull calves received one of the three following castration/implant treatments: 1) castrated at 3 months of age; 2) castrated and implanted at 3 months of age; or 3) not castrated until weaning. Heifer calves were either implanted at 3 months of age or not implanted. On July 1, creep access was initiated by limiting the access of cows to a novel endophyte tall fescue or crabgrass pastures. At weaning on September 22, calves were placed in a feedlot for 28-days. Bull calves were then banded. Calves were fed 5.4 kg head/d of a milled diet containing grass hay, soybean hulls, cracked corn, and soybean meal. On October 20, calves were placed on E+ K-31 for 170-d. Calves had ad libitum access to bermudagrass hay and mineral, and were supplemented with 0.9 kg corn/head/d until April 7, 2004. Data was analyzed as a split-plot experiment by PROC MIXED in SAS. Treatments had no effect on cow BW (P > 0.19) or BCS (P > 0.17). At weaning, implanted steer calves weighed 21 kg heavier (P = 0.03) than non-implanted steers, while intact bull calves were not different than non-implanted steers (P = 0.37). Castration/implant treatments had no effect on BW after the 28-d weaning period (P = 0.18) or after grazing K-31 (P = 0.21). Implant treatment had no effect on heifer calf BW at weaning (P = 0.90), after the 28-d weaning period (P = 0.52), or after grazing K-31 (P = 0.47). Creep treatments had no effect on calf BW, regardless of gender, at weaning (P = 0.79), after the 28-d weaning period (P = 0.61), or after grazing K-31 (P = 0.28).

Key Words: Beef Cattle, Creep Grazing, Implants

83 Impact of implant anomaly on performance and return of stocker cattle. P. A. Beck* and S. A. Gunter, *University of Arkansas, SW Research & Extension Center*.

Proper technique at processing time is essential and nowhere is this easier to demonstrate than when applying growth promoting implants. Implant pellets are often crushed or bunched when applied, it is not well known what affect these problems have on animal performance. This study was designed to evaluate the performance and economic returns of stocker steers implanted incorrectly compared to non-implanted and correctly implanted steers. Crossbred steers (n = 36, BW = 321 kg) grazing mixed bermudagrass/tall fescue pasture were weighed unshrunk on 12 June and one of four treatment were randomly applied.

Treatments included 1) control (no implant), 2) implanted correctly (Component-S, Ivy Laboratories, Inc.), 3) crushing three of the six implants with pliers to simulate ramming of the implant into ear cartilage during implantation (Crushed), and 4) bunched implants by manipulating implant pellets into a 1 cm circle to simulate failure to withdraw implant gun on injection (Bunched). Steers were reweighed on 12 July, 9 August, and 6 September. On 12 July the implants were palpated to determine that all implant treatments were as assigned. Treatments were applied as a completely randomized design using initial steer BW as a covariate. Steer was considered the experimental unit and residual error served as the error term for analysis. Data were analyzed by ANOVA using the GLM procedure of SAS. Steer BW was not different ($P > 0.05$) among treatments on any date during the trial. On 9 August, correctly implanted steers tended ($P = 0.06$) to be 13 kg heavier than incorrectly implanted steers. From 14 June to 9 August, correctly implanted steers gained 0.26 kg/d more ($P\#88040.05$) than non-implanted or incorrectly implanted steers. From 9 August to 6 September, steers correctly implanted lost 0.91 kg, while non-implanted steers and incorrectly implanted steers gained 2.6 and 6.8 kg, respectively. From 14 June to 6 September, ADG was not different ($P>0.11$) among treatments. Using current markets and a $6/45.4 kg slide, implanting correctly increased gross returns/steer by $12.82, while crushed implants returned $7.11 and bunched implants returned $1.30.

Key Words: Beef Cattle, Implants

84   Corn gluten feed as a diet ingredient for Senepol- or Angus-sired finishing steers. M. H. Poore*, J. P. Cassady, and G. A. Benson, *North Carolina State University*.

Wet and dry corn gluten feed (CGF) were evaluated as alternative ingredients for finishing diets. Steers from the North Carolina Department of Agriculture, Center for Environmental Farming Systems in Goldsboro, NC were individually fed one of three diets. Steer progeny of one Senepol (n=12, initial wt 341 kg) and five Angus bulls (n=21, initial wt 341 kg) were used. The control diet was 10% corn silage (CS), 78% corn (C), 10% soybean meal (SBM) and 2% minerals (DM basis). To make the other two diets, dry (DG) or wet (WG) CGF was substituted at 35% of DM for C and SBM. Diets were formulated to contain 13.5% CP and a Ca:P ratio of at least 1.7:1. Steers were fed for 138 d until steers on the control were visually evaluated to be near 1.25 cm back fat. Final wt was calculated using carcass weight and average dressing percentage. Senepol-sired calves had lower ADG (P = 0.02, 1.35 vs 1.56 kg/d), DMI (P = 0.03, 9.24 vs 10.41 kg/d), and carcass wt (P = 0.06, 329 vs 346 kg), and higher KPH (P = 0.04, 2.46 vs 2.04%) than Angus-sired calves. Diets were compared using two preplanned contrasts; control vs CGF diets, and DG vs WG. Control had lower (P = 0.03) DMI than the CGF diets, and DG tended to have higher (P = 0.10) DMI than WG (9.59, 10.90 and 10.14 kg/d for control, DG and WG, respectively). Gain to feed was similar for control and CGF diets, but DG tended to have a lower (P = 0.08) gain to feed than WG (0.153, 0.142 and 0.152 for control, DG and WG, respectively). Yield grade (3.16), carcass weight (343 kg), dressing % (62.4), ADG (1.52 kg/d), back fat (1.29 cm), ribeye area (79.2 sq cm), KPH (2.11%) and marbling scores (5.41) were not influenced by diet. Feed cost of gain (assuming as fed prices of 30, 40, 100, 120 and 275 $/909 kg for CS, wet CGF, dry CGF, C and SBM, respectively) did not differ between sire breeds, but was lower (P = 0.06) for CGF diets than the control (1.10, 1.02 and 1.05 $/kg, for control, DG and WG, respectively). Performance and carcass characteristics were acceptable when CGF was substituted into diets, and either wet or dry CGF may be economical depending on their price relative to C and SBM.

Key Words: Cattle, Finishing, Corn Gluten Feed

85   Effects of feeding soybean hulls or corn gluten feed during the preconditioning period on feedlot performance and carcass characteristics of Angus steers. J. E. Rossi*[1] and P. Worley[2], [1]*University of Georgia, Coastal Plain Experiment Station*, [2]*Northwest Research and Education Center, Calhoun*.

A 42 d trial was conducted using Angus steers (n=144; BW = 270 ± 2.5 kg) in a completely randomized design with a 2 x 2 factorial arrangement of treatments to determine effects of daily gains of 1.14 kg/d (HIGH) or 0.68 kg/d (LOW) and supplemental feed source of soybean hulls (SH) or corn gluten feed (CG) during the preconditioning period on feedlot performance and carcass characteristics. All steers were offered fescue

hay (12.8% CP) ad libitum. Steers were fed either corn gluten feed or soybean hulls plus 0.3 kg/d soybean meal. Supplemental feed was adjusted during the trial to maintain weight gain at the targeted level. At the end of the preconditioning period, all calves were commingled, shipped to a feedlot in IA, and fed a corn-based finishing diet for 152 days. Supplemental feed offered to steers was 1.7, 3.6, 1.5, and 4.1 kg/d for SH-LOW, SH-HIGH, CG-LOW, and CG-HIGH, respectively. Steers fed the CG-HIGH diet consumed less (1.8 kg/d; P < 0.05) hay than steers fed the SH-HIGH (2.8 kg/d), SH-LOW (3.0 kg/d), and CG-LOW (3.3 kg/d) diets. There was a gain × feed source interaction (P < 0.01) for daily gain during the preconditioning period and gains were 0.70, 1.23, 0.71, and 0.99 kg/d for SH-LOW, SH-HIGH, CG-LOW, and CG-HIGH, respectively. Daily gain during the feedlot period was 1.40, 1.29, 1.35, and 1.38 kg/d for SH-LOW, SH-HIGH, CG-LOW, and CG-HIGH, respectively (gain × feed source interaction, P < 0.01). There was a gain × feed source interaction for marbling score (P < 0.01) and was 339, 385, 394, and 358 for SH-LOW, SH-HIGH, CG-LOW, and CG-HIGH, respectively. There were no differences (P > 0.12) among treatments for hot carcass weight, dressing percentage, percentage choice, or yield grade. During the preconditioning period, corn gluten feed depressed intake of hay and reduced gains when fed at 1.4% of BW compared with feeding soybean hulls at 1.2% of BW. Marbling scores increased in steers fed a high level of soybean hulls during the preconditioning period but decreased in steers fed a high level of corn gluten feed during the preconditioning period.

Key Words: By-Products, Steers, Preconditioning

86   Milk production evaluation of straightbred Nellore and Nellore x Red Angus crossbred primiparous cows. J. M. B. Vendramini* and N. C. Favero, *University of Florida*.

Milk production is an important factor impacting calf performance and profitability of the production system. The objective of this study was to measure milk production and calf performance from straightbred Nellore vs. Nellore-Red Angus primiparous cows in Tres Lagoas-MS, Brazil from 3 Jan. to 25 May 2003. Treatments were a factorial combination of two breeds (Nellore and Nellore-Red Angus) and sex of the calves with five replications. Calves were born between 1 Nov. and 15 Nov. 2002 and were allocated in a planted Brachiaria brizantha pasture with free choice access to water and a mineral mixture. Milk production was measured every 28 d by the weigh-suckle-weigh method. The calves were separated from the dam for 8 h, weighed and allowed to suckle for 20 min prior to collection of a second BW measure. Three measurements were done during a 24-h period and the sum was considered the daily milk production. Forage herbage mass and nutritive value was evaluated on 28-d intervals. Milk production was greater (P < 0.05, SE = 0.45) for Nellore-Red Angus cows compared to straightbred Nellore cows (7.5 and 5.8 kg/d, respectively). Calf sex and sampling time had no effect (P > 0.05) on milk production. Calves from Nellore-Red Angus cows had a greater (P < 0.05, SE = 0.02) ADG (0.83 kg/d) than calves from straightbred Nellore cows (0.62 kg/d). Cow ADG did not differ between treatments (0.27 and 0.26 kg/d for Nellore'Red Angus and straightbred Nellore, respectively). Forage mass did not differ over time with an average value of 1900 kg DM/ha; however, there was a linear decrease in forage CP (12.0 to 5.0%) and IVOMD (63.0 to 48.0%) from Jan. to May. Crossbreeding programs involving Nellore and Red Angus may be a useful management practice to improve cow milk production and subsequent calf performance in Brazilian cow-calf systems.

Key Words: Nellore, Angus, Milk Production

87   Assessing and improving mineral status of a cow-calf herd. J. Gentry*[1], K. Downs[1], W. Gill[2], and A. Fisher[2], [1]*Middle Tennessee State University*, [2]*University of Tennessee*.

The objectives of this experiment were to determine if an imbalance of copper (Cu) and selenium (Se) exists in a cow herd and to determine the efficacy of an injectable mineral to reduce Cu and Se deficiencies in beef cattle herds located in the southeast. The treatments included (1) Control, (2) Cu bolus (25 g of copper oxide), and (3) injectable mineral (Mineral Max[TM], which included both Cu and Se). The treatments were administered one month prior to breeding. The study began on November 5, 2003 and cows were bred in early December. Cattle were maintained on tall fescue (*Festuca arundinacea*) pastures and fed supplemental hay during the winter months. All cows had *ad libitum*

access to a mineral mixture (830 ppm of Cu, 26 ppm Se, non-chelated). Cows were weighed on d 0, at breeding, and at weaning (April 20, 2004). Performance and health records were maintained throughout the experiment. Cows were scored for hair coat (1 = healthy coat appearance; 5 = hair clearly dead and brittle) and body condition score (1 to 9; 1 = severely emaciated; 9 = very obese) on d 0, at breeding, and at weaning. Serum samples were analyzed for Cu and Se levels. Data were analyzed as a completely randomized design using General Linear Models (GLM) procedures of SAS. Initial serum levels for Cu and Se were well below the normal range (normal = 0.8 to 1.5 ppm Cu and 0.08 to 0.3 ppm Se). Serum Cu levels were 0.55, 0.52, and 0.54 ± 0.03 for the Control, Bolus, and Injectable treatments, respectively, at the end of the trial ($P > 0.05$). Neither Cu nor Se levels were significantly different among treatments at the end of the trial. Visual scores for hair coat and body condition were not different. Body condition score decreased due to lactation across all treatments, but scores were not different among the treatments. No significant differences were observed for beef cow weights or calf weaning weights. Further investigation is needed to monitor and improve mineral imbalances of cow herds in the southeast.

Key Words: Beef Cattle, Copper, Selenium

88 Effect of source of energy on growth and reproduction of replacement beef heifers. J. C. Wuenschel*[1], D. L. Cuddy, S. P. Greiner, and J. B. Hall, *Virginia Tech*.

The objective of this experiment was to determine if the source of energy (starch vs. fat vs. fiber) affects age at puberty, growth or conception rates in replacement heifers. During 2 yr, heifers (n = 72) were randomly assigned to a cottonseed (HiFat; 5% crude fat), soyhull (HiFiber) or corn/soybean meal (HiStarch) containing supplements. Heifers were grazed on stockpiled fescue pastures with hay available when grazing was limited. Grazing plus supplement was designed to meet requirements for growing heifers (NRC, 1996), and produce gains of 0.8 $kg \cdot hd^{-1} \cdot d^{-1}$. Supplements were isonitrogenous and isoenergetic and provided 0.53 kg CP and 2.2 kg $TDN \cdot hd^{-1} \cdot d^{-1}$. Heifers were fed 2.5 kg, 2.75 kg, and 2.5 kg daily for HiFat, HiFiber, and HiStarch supplements, respectively. Heifers were fed in two replicates$\cdot trt^{-1} \cdot yr^{-1}$. Heifers were weighed every 14 d. Diets were fed for 75 d before and 15 d after AI. Heifers were estrus synchronized and bred AI 12 h after detected estrus. All heifers not in estrus by 72 h after PGF were administered 100 μg GnRH and bred by fixed time AI. Fourteen d after AI, heifers were exposed to bulls for a 30 d. Pregnancy rate (PR) was determined by ultrasound at 60 and 90 d after AI. Dietary treatment did not affect ($P > 0.3$) heifer BW or ADG. However, initial and final BW were greater ($P < 0.03$) in Year 2 (initial, 330.0 ± 7.6 kg; final, 384.3 ± 8.4 kg) than in Year 1 (initial, 304.6 ± 7.6 kg; final, 369.2 ± 8.4 kg),whereas, average daily gain was greater ($P < 0.03$) for heifers in Year 1 than Year 2 (0.85 ± 0.05 $kg \cdot d^{-1}$ vs 0.72 ± 0.05 $kg \cdot d^{-1}$). Across years, AI PR was similar ($P > 0.2$) and averaged 45.8% (11/24), 45.8% (11/24), and 54.1% (13/24) for HiFat, HiFiber, and HiStarch, respectively. Final PR were similar ($P < 0.5$) among heifers fed the three supplements and averaged 79.2%. Cost of supplement$\cdot heifer^{-1} \cdot d^{-1}$ was $0.43, $0.44, and $0.46 for HiFat, HiFiber, and HiStarch, respectively. We conclude that acceptable growth and pregnancy rates were achieved irrespective of source of dietary energy.

Key Words: Heifers, Nutrition, Reproduction

Meat Science

89 Relationship between ultrasound and carcass measures of Charolais-cross harvest cattle using an automated computer tracing software. T. Perkins*[1], C. Fercherio[2], and J. Worthington[1], [1]*Southwest Missouri State University*, [2]*Purina Mills, LLC*.

Yearling beef steers (n=86) representing typical Charolais-cross commercial cattle, were evaluated for body composition measures of muscle and fat deposition utilizing real-time ultrasound measurements. Target harvest date was estimated based on 12th rib fat thickness and weight (approximately 250 days on feed). Steers were harvested 35 days after being scanned with an ALOKA 500V ultrasound unit equipped with a UST-5049 transducer. Images were processed chuteside using Beef Image Analysis (BIA) automated software. Images were also saved to the computer hard drive and manually interpreted using Beef Image Analysis non-automated software. Mean scan live weight and carcass weight was 582.89 ± 36.44 kg and 380.8 ± 28.05 kg, respectively. Mean automated chuteside ultrasound fat thickness (AFTU), ribeye area (AREAU) and percent fat (A%FATU) were 0.88 ± 0.22 cm, 97.19 ± 7.45 cm^2, 4.16 $\pm$ .48 %. Mean manually interpreted ultrasound fat thickness (IFTU), ribeye area (IREAU) and percent fat (I%FATU) were 0.89 ± 0.24 cm, 96.36 ± 7.45 cm^2, $4.40 \pm$ .73 %. Mean carcass measures of fat thickness (FTC), ribeye area (REAC) and percent fat (%FATC) were 1.15 ± 0.35 cm, 94.17 ± 7.45 cm^2, $3.91 \pm$ .75 %. Favorable pearson correlations between AFTU and FTC, IFTU and FTC, IREAU and REAC, A%FATU and %FATC, I%FATU and %FATC were 0.80, 0.78, 0.47, 0.59 and 0.69, respectively; whereas, the correlation between AREAU and REAC were lower and less significant at 0.22. These coefficients indicate that the relationship between manually interpreted ultrasound images and harvest carcass attributes were high and statistically significant. However, these results indicate that automated chuteside image processing was not as useful a tool in assessing ribeye levels on steers prior to harvest.

Key Words: Ultrasound, Steer, Harvest

90 Fatty acid profiles and meat characteristics of different biological types of beef cattle developed on grazed forages under a rotational management-intensive grazing system. M. Thomas*[1], D. Kellogg[1], A. Brown[1], D. Rule[2], Z. Johnson[1], K. Anschutz[1], R. Baublits[1], and C. Murietta[2], [1]*University of Arkansas*, [2]*University of Wyoming*.

Yearling beef steers (n = 33) representing four biological types, were evaluated for fatty acid profiles and meat characteristics in muscle tissue. Steers were developed on forages using a rotational management-intensive grazing system. Biological types included large-framed, late maturing (LL; n = 6), medium-framed, late maturing (ML; n = 9), medium-framed, intermediate maturing (MI; n = 9) and medium-framed, early maturing (ME; n = 9) steers. Steers were harvested based on a target weight of 454 kg and body condition score of 6.0 (1= emaciated to 9 = obese). Longissimus dorsi (LD) muscles were removed and frozen after 7 d dry aging. Warner-Bratzler shear force and cooking loss tests were conducted on one subsample. Other subsamples of the LD were prepared for fatty acid methyl ester (FAME) analysis. FAMEs were separated using the GLC. No differences (P > 0.05) were found between biological types and tenderness or cooking loss. Significant differences (P < 0.05) were found between biological types and fatty acid profiles. The following fatty acids showed differences (P < 0.05) by biological type: 14:0, 14:1; 16:0, 17:1; 18:0; 18:2 n - 6; 18:3 n - 3, CLA; 20:3 n - 3; 20:4 n - 6; 20:5 n - 3; 22:5 n - 3, 22:6 n - 3, total n - 6; total n - 3; and the n - 6 / n - 3 ratio. All steers had a mean n - 6 / n - 3 ratio below the recommended < 4:1 for human cardiovascular health. The ME steers scored highest (P < 0.05) in marbling and had the lowest n - 6 / n - 3 ratio at 1.03. The ML had the next lowest ratio at 1.11, MI at 1.17, and LL at 1.28. The strongest correlation coefficient (-0.79) occurred between days on grass and the n - 6 / n - 3 ratio suggesting as the length of the grazing period increased the ratio became more favorable. Under this dietary management system, ME beef steers should be considered for producing grassfed beef.

Key Words: Fatty Acids, Biological Types, Grassfed Beef

91 Effects of dietary fat source on carcass fatty acid composition of pigs slaughtered at 113.6 kg. J. K. Apple*, C. V. Maxwell, D. L. Galloway, and L. K. Rakes, *Department of Animal Sciences, University of Arkansas.*

Crossbred pigs were used to test the effects of dietary fat source on the fatty acid (FA) composition of growing-finishing swine. Pigs were blocked by weight, and, within blocks, pens (8 pigs/pen) were randomly assigned to either control corn-soybean meal starter (27.2 to 45.5 kg), grower-I (45.5 to 68.0 kg), grower-II (68.0 to 90.9 kg) and finisher (90.9 to 113.6 kg) diets (C), or diets containing 4% beef tallow (BT), poultry fat (PF), or soybean oil (SBO). One pig from each pen (8 pens/treatment) was randomly selected for slaughter and carcass dissection at a mean pen weight of 45.5, 68.0, 90.9, and 113.6 kg. After dissection, lean and fat tissues were ground and composite samples were collected from each pig for FA composition analysis. Results are for only pigs slaughtered at 113.6 kg (n = 36). Pigs fed C diets had the greatest (P < 0.001) proportion of SFA, especially palmitic (C16:0) and stearic (C18:0) acids, compared to the other treatments, whereas BT-fed pigs had the greatest (P < 0.001) proportions of oleic acid (C18:1) and total MUFA compared with other dietary treatments. Samples from SBO-fed pigs had the lowest (P < 0.001) percentages of SFA and MUFA, but, when compared to the other treatments, SBO-fed pigs had the highest (P < 0.001) proportions of linoleic (C18:2) and linolenic (C18:3) acids, resulting in the highest (P < 0.001) percentage of total PUFA. Samples from pigs fed BT had higher (P < 0.001) conjugated linoleic acid (C18:2 cis 9, trans 11; CLA) proportions than all other treatments, and samples from PF-fed pigs had higher (P < 0.001) CLA proportions than C- or SBO-fed pigs. Percentages of n-3 and n-6 FA were highest (P < 0.001) in samples from pigs fed SBO; yet, samples of SBO-fed pigs had substantially lower (P < 0.001) n-6:n-3 and P/S ratios than all other dietary treatments. As expected, pigs fed animal fats (BT and PF) had greater (P < 0.001) proportions of trans FA than pigs fed the C or SBO diets. Results of the present study indicate that dietary fat source impacts pork carcass FA composition, which, in turn, could impact the quality of fresh and further processed pork products.

Key Words: Fat Source, Fatty Acid Composition, Pigs

92 Effects of sodium chloride, phosphate type and concentration, and pump rate on beef *biceps femoris* quality and sensory characteristics. R. T. Baublits*, F. W. Pohlman, A. H. Brown, Jr., and Z. B. Johnson, *University of Arkansas.*

The effects of enhancing beef *biceps femoris* muscles (n = 45) with solutions comprising 2.0 % sodium chloride and either sodium hexametaphosphate (SHMP), sodium tripolyphosphate (STPP), or tetrasodium pyrophosphate (TSPP) at either 0.2 % or 0.4 % of product weight on quality and sensory characteristics were evaluated. All solutions were injected into muscle samples at either 112 % (12 % pump) or 118 % (18 % pump) of raw product weight. Post-injection muscle pH was lower (P < 0.05) for SHMP-treated muscles than for STPP- or TSPP-treated muscles. Although there were no differences (P > 0.05) in percent moisture between phosphate types, both STPP- and TSPP-treated muscles had less (P < 0.05) free water than SHMP-treated muscles. Regardless of phosphate type, muscles treated with 0.4 % phosphates were able to adsorb greater (P < 0.05) additional water than those treated with 0.2 % phosphates. Steaks injected at 18 % pump had greater (P < 0.05) percent moisture, and did not differ (P > 0.05) in free water, water binding, or cooking losses from steaks injected at 12 % pump. Furthermore, steaks treated with STPP or TSPP had lower (P < 0.05) cooking losses than steaks treated with SHMP. While no differences (P > 0.05) in Warner-Bratzler shear force were observed, steaks treated with 0.4 % phosphates or injected at an 18 % pump rate were rated more tender (P < 0.05) by a sensory panel than steaks treated with 0.2 % phosphates or injected a 12 % pump rate, respectively. These results suggest that when used in combination with 2.0 % sodium chloride, STPP and TSPP are more effective at retaining water and reducing cooking losses than SHMP. Additionally, regardless of the phosphate/salt combination, utilizing a higher pump rate was effective in improving sensory-evaluated tenderness without increased water or cooking losses.

Key Words: Beef, Phosphate, Palatability

93 Effects of sodium chloride, phosphate type and concentration, and pump rate on beef *biceps femoris* instrumental color characteristics. R. T. Baublits*, F. W. Pohlman, A. H. Brown, Jr., and Z. B. Johnson, *University of Arkansas.*

Beef *biceps femoris* muscles (n = 45) enhanced with 2.0 % sodium chloride and either sodium hexametaphosphate (SHMP), sodium tripolyphosphate (STPP), or tetrasodium pyrophosphate (TSPP) at either 0.2 % or 0.4 % of product weight were evaluated for instrumental color during simulated retail display. All solutions were injected into muscle samples at either 112 % (12 % pump) or 118 % (18 % pump) of raw product weight. No differences (P > 0.05) in L* or b* values were observed between phosphate types throughout seven days of retail display. Similarly, no differences (P > 0.05) in L* or b* values were observed between pump rates, however, steaks treated with phosphates at 0.4 % concentrations maintained higher (P < 0.05) b* values on days 3 and 5 of display. Steaks treated with STPP had higher (P < 0.05) a* values than SHMP-treated steaks on day 3, and steaks treated with either STPP or TSPP had higher (P < 0.05) a* values than SHMP-treated steaks on days 5 and 7 of display. Disregarding day 1, steaks treated with phosphates at 0.4 % concentrations maintained higher (P < 0.05) a* values than those treated with 0.2 % concentrations throughout display. The 630 / 580 nm results indicated that SHMP-treated steaks maintained lower (P < 0.05) proportions of oxymyoglobin than STPP- or TSPP-treated steaks on days 3 and 5 of display. Additionally, steaks treated with 0.4 % phosphate concentrations maintained higher (P < 0.05) proportions of oxymyoglobin on days 3 through 7 of retail display than steaks treated with 0.2 % phosphate concentrations. These results suggest that STPP or TSPP are more effective than SHMP in maintaining color during retail display in whole muscle beef cuts when used in combination with sodium chloride. Additionally, while pump rate had little impact on color under these conditions, higher phosphate concentrations allowed for improved color throughout display.

Key Words: Beef, Phosphate, Instrumental color

94 Meat quality and sensory characteristics of beef *biceps femoris* steaks treated with sodium chloride and differing phosphate types, concentrations and pump rates, compared with untreated steaks or steaks treated with only sodium chloride. R. T. Baublits*, F. W. Pohlman, A. H. Brown, Jr., and Z. B. Johnson, *University of Arkansas.*

Beef *biceps femoris* muscles (n = 45) were used to evaluate the effect of enhancement with solutions comprising 2.0 % sodium chloride and either sodium hexametaphosphate (SHMP), sodium tripolyphosphate (STPP), or tetrasodium pyrophosphate (TSPP) at either 0.2 % or 0.4 % of product weight. All solutions were injected into muscle samples at either 112 % (12 % pump) or 118 % (18 % pump) of raw product weight. When compared to untreated muscles (CNT), or muscles treated only with sodium chloride (NaCl), muscles treated with 0.2 % or 0.4 % phosphate, or injected at a 12 % or 18 % pump rate generally had relative performance for most characteristics in this study. Muscles treated with all three phosphate types had decreased (P < 0.05) free water compared to untreated muscles (CNT), and while TSPP-treated muscles were able to bind greater (P < 0.05) additional water than CNT, STPP- and SHMP-treated muscles did not differ (P > 0.05) in water-binding from CNT. Additionally, while STPP- and TSPP-treated muscles had less (P < 0.05) free water than muscles treated with only NaCl, SHMP-treated muscles did not differ (P > 0.05) from NaCl-treated muscles. Steaks treated with STPP or TSPP had lower (P < 0.05) cooking losses than CNT and NaCl, while SHMP-treated steaks did not differ (P > 0.05) from CNT or NaCl. Although there were no differences (P > 0.05) in Warner-Bratzler shear force in this study, steaks treated with SHMP, STPP, and TSPP all were rated more tender, and juicier (P < 0.05) by sensory panelists than CNT steaks or steaks enhanced only with NaCl. These results suggest that enhancing *biceps femoris* muscles with STPP or TSPP can improve water retention and yield characteristics, and either of the three phosphate types, when used in combination with salt, can be effective in improving sensory tenderness and juiciness characteristics compared to untreated muscles or muscles treated only with salt.

Key Words: Beef, Phosphate, Water-Retention

95   Instrumental color characteristics of beef *biceps femoris* steaks treated with sodium chloride and differing phosphate types, concentrations or pump rates, compared with untreated steaks or steaks treated with only sodium chloride. R. T. Baublits*, F. W. Pohlman, A. H. Brown, Jr., and Z. B. Johnson, *University of Arkansas*.

The effect of enhancing beef *biceps femoris* muscles (n = 45) with solutions comprising 2.0 % sodium chloride and either sodium hexametaphosphate (SHMP), sodium tripolyphosphate (STPP), or tetrasodium pyrophosphate (TSPP) at either 0.2 % or 0.4 % of product weight on instrumental color during simulated retail display was investigated. All solutions were injected into muscle samples at either 112 % (12 % pump) or 118 % (18 % pump) of raw product weight. Muscles treated with all three phosphate types had lower (P < 0.05) L* and b* values compared to untreated muscles (CNT). Steaks enhanced with STPP had similar (P > 0.05) a* values as CNT, whereas SHMP- and TSPP-treated steaks generally had lower a* values than CNT. Across phosphate type, steaks treated with phosphate at 0.4 % generally had similar (P > 0.05) a* values as CNT, whereas those with 0.2 % phosphate addition had lower (P < 0.05) a* values than CNT. Across five days of display, STPP maintained higher (P < 0.05) a* values than steaks treated with only sodium chloride, whereas SHMP did not differ (P > 0.05) from sodium chloride-treated steaks. While STPP maintained a similar (P > 0.05) saturation index as CNT, SHMP and TSPP generally had decreased (P < 0.05) vividness during display. The 630/580 nm ratio indicated that SHMP had less (P < 0.05) oxymyoglobin than CNT throughout display. Disregarding day three, both STPP and TSPP had similar (P > 0.05) oxymyoglobin proportions as CNT. These results indicate that when compared to untreated muscles, muscles enhanced with 0.4 % phosphate concentrations can maintain color better than those enhanced with 0.2 % phosphate concentrations. Additionally, when used in combination with salt, STPP was effective for maintaining color, generally allowing for similar beef color as untreated controls through display.

Key Words: Beef, Phosphate, Instrumental Color

Tropically Adapted Breeds, Regional Project S1013-S277
(Invited Speakers Only)

96   Rationale for evaluating alternative sources of subtropically adapted beef cattle germplasm. F. A. Thrift*[1] and T. A. Thrift*[2], [1]*University of Kentucky,* [2]*University of Florida*.

Considerable effort has been directed to evaluating the Brahman breed, primarily for crossbreeding, in a wide array of environments. Results indicate that in the hot/humid southeast and Gulf Coast areas and even in more temperate areas of the U.S., weaning productivity of Brahman x Bos taurus cows is virtually unequaled. These cows express longevity because of calving ease and resistance to ectoparasites (horn-flies, mosquitoes, ticks), endoparasites (gastrointestinal helminths), eye disorders (infectious bovine keratoconjunctivitis, ocular squamous cell carcinoma), metabolic disorders (grass tetany) and dentition deterioration. However, problems are associated with production and management of these cows. Specifically, 1) subpar reproductive performance of Brahman bulls, 2) increased dystocia/reduced survival rate expressed by Brahman-sired calves, 3) older age at puberty, udder/teat abnormalities, vaginal/uterine prolapses and non-docile temperament expressed by Brahman-sired females and 4) price discounts for contemporary Brahman-sired steers and heifers are problems associated with the Brahman breed that have served as a major impetus to evaluate alternative sources of subtropically adapted beef cattle germplasm.

Key Words: Beef Cattle, Brahman, Subtropical Adaptation

97   Florida Crossbreeding Research. D. G. Riley*[1], G. R. Hansen[2], J. R. Crockett[2], T. A. Olson[2], and C. C. Chase, Jr.[1], [1]*ARS,* [2]*Univ. of Florida*.

This review highlights the accomplishments of three University of Florida beef cattle research locations from the 1940s through the late 1980s. During that time, the Everglades Research and Education Center at Belle Glade, the Range Cattle Research and Education Center at Ona, and the Beef Research Unit at Gainesville conducted long term crossbreeding research. These locations produced estimates of breed effects and heterosis for a variety of traits in Brahman and a number of other breeds. Most importantly, researchers at these facilities investigated the crossbred superiority (heterosis retained or expressed) in several crossbreeding systems, including terminal crosses, two- and three-breed rotations, and *inter se* matings (including F_1 and 3/8 - 5/8 parents). In most of these studies, formal tests were not conducted, but results generally supported the dominance model of heterosis expression for most reproductive and calf growth traits. However, there appeared to be large loss of heterosis for weaning rate (almost 40% of that expressed by F_1 cows with backcross calves) for 3/8 Brahman 5/8 Devon cows mated *inter se* at Belle Glade. There was almost a total loss of the heterosis expressed for 18-mo weight in 3/8 Brahman 5/8 Devon heifers at Belle Glade and for cow weight in F_2, backcross, and three-breed cross (Brahman, Charolais, and Angus) cows at Ona. Early work in Florida also emphasized the complex interaction of reproductive performance with lactation status, age of cow, and nutritional plane in Brahman and Brahman-cross cows. There appears to be a negative autocorrelation between successive reproductive events that correspond with the age of the cow; it seems that reproductive performance in a given year could be effectively predicted with knowledge of lactation status in the previous breeding season. This is especially important considering the high cost of heifer development, the late onset of puberty in Brahman heifers, and the longer gestation length of Brahman calves. This research has provided a framework to build future investigations of Brahman crossbred superiority, especially for reproductive traits.

Key Words: Brahman, Crossbreeding, Florida

98   Reproduction of Bos indicus breeds and crosses. R. D. Randel*, *Texas A&M University Agricultural Research and Extension Center - Overton*.

Reproductive endocrinology of Bos indicus cattle differs from Bos taurus cattle. The duration of estrus is shorter and less intense and occurs late in relation to an estrogen stimulus in Bos indicus females. The Bos indicus female has a smaller preovulatory LH surge which occurs earlier relative to the onset of estrus and ovulation occurs earlier after the onset of estrus. The corpus luteum of Bos indicus females is smaller and contains less progesterone resulting in lower concentrations of circulating progesterone. Crosses between Bos indicus and Bos taurus are intermediate with respect to these endocrine parameters. Bos indicus males secrete LH in the same pulsatile pattern as Bos taurus but at lower concentrations. Testis response to LH is similar between Bos indicus and Bos taurus bulls with lower circulating concentrations of testosterone in the Bos indicus. The greatest reproductive difference between Bos indicus and Bos taurus cattle is the greater age at puberty in both female and male Bos indicus cattle. Most crosses reach puberty nearer the Bos taurus parent breed than the Bos indicus parent breed. Seasonality of reproductive efficiency differs between Bos indicus and Bos taurus. Bos indicus cattle have reduced reproduction during the winter while Bos taurus cattle can have reduced reproduction during extreme summer temperatures. During the winter, Bos indicus females have reduced preovulatory LH surges and become anovulatory. During the extremes of summer temperatures, Bos taurus females have reduced oocyte quality and reduced conception rates and Bos taurus males have reduced semen quality. Some of the advantage for Bos indicus x Bos taurus crosses in reproduction may derive from their ability to maintain reproductive efficiency during extremes in temperature and photoperiod throughout the year.

Key Words: Bos Indicus, Bos Taurus, Reproduction

99 Birth to harvest attributes of Brahman and Brahman-influenced steers. F. M. Rouquette*[1], C. R. Long[1], J. J. Cleere[2], and R. D. Randel[1], [1]*Texas Agricultural Experiment Station,* [2]*Texas Cooperative Extension.*

Use of tropically adapted beef genotypes by commercial cow-calf, stocker, and feeder operations depends on biological boundaries of reproduction, growth, and carcass attributes as well as economic considerations of product. Multiple experiments at TAMU-Overton used Brahman (BB) (*Bos indicus*), Tuli x Brahman (TB), Angus x Brahman (AB), and Hereford x Brahman (HB) steers to document component growth during pre-weaning, stocker, and feedlot stages. Primary emphasis on post-weaning growth from rye (*Secale cereale*) + ryegrass (*Lolium multiflorum*) or bermudagrass (*Cynodon dactylon*) pastures, and resultant feedlot performance and carcass physical and sensory traits were compared for BB, TB, AB, and HB steers. The AB and HB steers performed similar on pasture and feedlot and both genotypes had greater gains than BB or TB. Average daily gain of AB and HB steers grazing winter pastures was about 1.2 kg/d; whereas, BB and TB had ADG of about 0.9 to 1.0 kg/d. The BB had lower feedlot gains (1.4 kg/d) compared to AB or HB (1.8 kg/d). Daily consumption of feedlot ration was generally lower for BB compared to AB or HB; however gain:feed conversions were often similar among genotypes. With the exception of hot carcass weight and longisimus area being greater for AB and HB steers, carcass traits and tenderness indicators were often similar for BB and the AB or HB steers. Economic considerations and pricing discriminations at growth stage end-points were regionally-driven which has primary impact on commercial producer acceptance.

Key Words: Brahman, Pasture, Feedlot

100 Zero, 1/4, and 1/2 Brahman cows in spring vs fall calving programs. D. Buchanan* and R. Frahm, *Oklahoma Agricultural Experiment Station.*

Bos indicus genetics are of interest in the beef industry of the southern United States. Oklahoma sits along the border between the hotter, more humid climate of the South and more temperate areas of the Midwest. It is also a region where many beef producers use both spring and fall calving seasons. The purpose of this research was to examine proportions of Brahman breeding in spring vs fall calving seasons. A cow herd was developed, over a three year period, by mating purebred Hereford and Angus cows to Angus, Hereford, Brahman, $\frac{1}{2}$ Brahman-$\frac{1}{2}$ Angus and $\frac{1}{2}$ Brahman-$\frac{1}{2}$ Hereford bulls. These matings produced heifers which were Angus-Hereford, Hereford-Angus, Brahman- Angus-$\frac{1}{2}$ Hereford, Brahman- Hereford-$\frac{1}{2}$ Angus, $\frac{1}{2}$ Brahman-$\frac{1}{2}$ Angus or $\frac{1}{2}$ Brahman- $\frac{1}{2}$ Hereford. The design was a 3 x 2 factorial arrangement of 0, , and $\frac{1}{2}$ Brahman in fall vs spring calving seasons. All heifers were managed to enable them to calve at two years of age and were kept in the herd, unless physical infirmity or failure to become pregnant for two consecutive years, until all the cows were more than ten years old. More than 300 heifers started the experiment. Cows were mated, artificially, to bulls from one or two sire breeds each year. A total of 773 breeding and 596 weaning records were produced during the six year period from 1986 to 1991 among cows that ranged in age from five to eight years. There was an interaction (P<.05) between % Brahman and season of calving for age adjusted weaning weight. Least squares means were 239, 252 and 262 kg for 0, and $\frac{1}{2}$ Brahman among spring born calves and 212, 241 and 253 kg for fall born calves. There was a difference (P<.05) among differing % Brahman but not a significant interaction between % Brahman and season, for calf crop born. Least squares means were 90, 85 and 77% for 0, and $\frac{1}{2}$ Brahman, respectively. These results, along with those previously published, suggest that maternal performance increased, as percent Brahman increased but that there was a serious compromise in reproductive performance, especially for the $\frac{1}{2}$ Brahman. Generally speaking, the most efficient proportion Brahman breeding was .

Key Words: Beef Cattle, Bos Indicus, Genotype x Environment Interaction

101 Cow-calf performance of Brahman-British and Brahman-Continental beef females. S. M. DeRouen*[1], W. E. Wyatt[2], P. E. Humes[3], D. E. Franke[3], and D. C. Blouin[3], [1]*Louisiana State University Agricultural Center, Homer,* [2]*Jeanerette,* [3]*Baton Rouge.*

Two separate studies were conducted to evaluate Brahman-British [Angus (AN), Hereford, Shorthorn] and Brahman-Continental [Gelbvieh (GV), Simmental] breeds and breed crosses for cow-calf performance. For Study 1 (S1), Brangus (BN), Beefmaster (BM), Gelbray (GE), and Simbrah (SI) composite breeds were compared. Nine BN, 12 BM, 10 GE, and 7 SI sires were used in straightbred and crossbred [Brahman x Hereford F_1 (BH) cows] matings to generate 326 calves. For Study 2 (S2), a total of 1014 reproductive and 752 calving records were collected. Nine AN, 6 BN, 7 GV, and 7 GE bulls were mated to BH cows to produce AN-, BN-, GV- and GE-sired females, respectively. Contemporary BH heifers from 8 sires were purchased at weaning. Separate analyses were conducted for each study using a generalized linear mixed model procedure. In S1, BM and BH cows were of similar BW, BN and GE cows were intermediate (P < 0.01), and SI cows were heaviest (P < 0.01). Calves sired by BN and BM bulls had lower birth (P < 0.05), weaning (P < 0.01), and 205-d (P < 0.01) weights than GE- and SI-sired calves. Simbrah-sired calves had greater weaning (P < 0.01) and 205-d (P < 0.05) weights than GE-sired calves. For dam breed type comparisons, weaning and 205-d weights were greater (P < 0.05) for BM- and BN-sired calves with BH dams than with BM and BN dams. Weaning and 205-d weights were similar for GE- and SI-sired calves out of GE and BH dams or SI and BH dams. In S2, BN-sired females had pregnancy rates that were 28 to 33% lower (P < 0.05) for first and second exposures and 13% lower (P < 0.05) as multiparous cows than AN-, GV-, GE-sired, and BH females. Body weight for AN-sired cows were heavier (P < 0.05) than BN-sired cows, and BW for GV- and GE-sired cows were similar. Calf 205-d weight for multiparous cows were heavier (P < 0.01) for BH cows than for AN-, BN-, GV-, and GE-sired cows. In summary, weaning weights were heavier for GE- and SI-sired calves, and BH cows had heavier weaning weights than BN and BM cows in S1. For S2, lower reproductive performance was exhibited by BN-sired females, and improved calf 205-d weight was achieved by BH females.

Key Words: Brahman, Breed Crosses, Weaning Weight

102 Feedlot performance and carcass characteristics of Brahman x British and Brahman x Continental Beef Steers. W. Wyatt*, S. DeRouen, T. Bidner, P. Humes, D. Franke, and D. Blouin, *Louisiana State University Agricultural Center.*

Two separate studies were conducted to evaluate Brahman-British [Angus (AN), Hereford, Shorthorn] and Brahman-Continental [Gelbvieh (GV), Simmental] breeds and breed crosses for steer feedlot performance and carcass characteristics. Angus (12), Beefmaster (9), Brangus (BN; 12), Gelbray (GE; 9) and Simbrah (6) sires were mated to cows of their own breed and to Brahman x Hereford F_1 (BH) cows to generate the 209 steers utilized in Study 1 (S1). The 231 steers used in Study 2 (S2) were sired by AN (9), BN (6), GV (7), and GE (7) bulls mated to BH cows. Breed combinations common to both studies were BN- and GE-sired steers having BH dams. All steers were spring born in S1 and spring and fall born in S2. Brahman-Continental (BC) steers required more days on feed (P < 0.05) to reach the targeted physiological end point (10 mm) than Brahman-British (BB) steers in both S1 and S2. Hot carcass weight was greater (P < 0.01) for BC than BB in S1, but was similar in S2. Dressing percentage did not differ between BC and BB in S1 and S2. Longissimus (LM) area was greater (P < 0.01) for BC than BB in S1, but no consistent advantage was observed in S2. Marbling score did not differ between BC and BB in S1, but was generally greater (P < 0.05) for BB than BC in S2. In general, shear force of the LM (and sensory evaluation for tenderness) was similar between BC and BB in S1, but shear force tended to be less for BB than BC steers in S2. Despite the increase in days on feed and carcass weight for BC steers, consistent differences in beef cutability and quality were not observed between BC and BB steers in the two studies.

Key Words: Brahman, Breed crosses, Tenderness

103   Reciprocal differences in gestation length and birth weight in Bos indicus/Bos taurus crosses. C. A. Gill*, T. S. Amen, J. O. Sanders, and A. D. Herring, *Texas A&M University*.

Reciprocal differences in gestation length (GL) and birth weight (BW) were evaluated in 511 calves from 28 full-sib Angus-*Bos indicus* (AB) backcross families produced by embryo transfer. Calves were 3/4 A-1/4 B (Brahman or Nellore) or 3/4 B-1/4 A and were produced by mating F_1 (AB or BA) bulls to purebred (A or B) cows; or, by mating purebred (A or B) bulls to F_1 (AB or BA) cows. Calves were born to 1/2 Brahman-1/2 British recipient dams. Backcross calves sired by A bulls and out of BA dams were carried for 289.6 days compared with 284.5 days for calves with AB dams. For calves sired by F_1 bulls out of A dams, GL was 290.4 days when the sire was BA as opposed to 288.4 days for AB sires. For calves from B sires and F_1 dams, GL was 296.1 days in calves from BA dams and 292.4 days for those from AB dams. For calves from F_1 sires and B dams, GL was 291.1 days in calves from BA sires compared with 288.3 days for calves from AB sires. Male backcross calves with AB sires and A dams were 8.0 kg heavier at birth than female calves of this cross, while BA-sired males calves out of A dams were 1.6 kg heavier than females of that cross. Male calves sired by B bulls were 4.4 kg and 4.7 kg heavier than female calves when the dam was AB and BA, respectively. Male calves with AB sires and A dams were 8.1kg heavier than male calves with A sires and AB dams. BA-sired male calves out of A dams were 2.6kg heavier than A-sired male calves with BA dams. B sired males with AB dams were 8.4 kg heavier than AB sired males with B dams, and B sired male calves with BA dams were 5.8 kg heavier than male calves with BA sires and B dams. Reciprocal differences in BW for female calves were in the same direction as those for male calves; however, none of the differences were of a significant magnitude. These *Bos indicus/Bos taurus* reciprocal differences have been widely reported in natural service calves, and these results for GL and BW are comparable with earlier reports in ET calves. We hypothesize that these reciprocal differences are due to a sex chromosome x autosome interaction and QTL analyses are ongoing.

Key Words: Reciprocal Crosses

104   Maternal and fetal genotype influences on fetal growth. C. L. Ferrell*, *USDA-ARS, U.S. Meat Animal Research Center*.

Objectives are to review influences of maternal and fetal genotype on fetal growth and development. Brahman (Br) cows with Br or Charolais (C) fetuses and C cows with Br or C fetuses were used. Indwelling catheters were placed in a uterine artery, uterine vein, umbilical vein, fetal femoral artery, and fetal femoral vein at 220 ± 0.4 d after embryo transfer. Uterine and umbilical blood flows (L/min) and net uptakes of glucose, lactate, α-amino N, urea N, ammonia N, and estrone sulfate by the gravid uterus, fetus, and uteroplacenta were determined on 227 ± 0.4 d. Cows were killed on 232 ± 0.5 d or 271 ± 0.7 d. Weights of the fetus, fetal membranes, cotyledons, caruncles, and uterus were recorded as were weights of the fetal liver, heart, kidneys, spleen, lungs, stomach complex, intestines, and semitendinosus muscle. Data were analyzed by analysis of variance with breed of cow (CB), breed of fetus (FB), day of gestation (D), and all interactions were included in the model as fixed effects. Uterine blood flow in Br cows with Br (5.01) or C (4.66) fetuses was similar, but less ($P<0.01$) than in C cows with Br (7.14) or C (9.24) fetuses, which differed ($P<0.01$). Umbilical blood flows of C (3.78) were greater ($P<0.01$) than those of Br (2.29) fetuses. Fetal uptake of oxygen, glucose, and α-amino N, gravid uterine uptake of α-amino N, and uteroplacental uptake of glucose were greater for C than for Br fetuses. Gravid uterine oxygen uptake and uteroplacental lactate release were influenced by CB×FB. Fetal weights were influenced ($P<0.01$) by CB, FB, D, CB×D and tended ($P=0.07$) to be influenced by CB×FB×D. Caruncular weights were greater for C than for Br cows ($P<0.05$) or fetuses ($P<0.01$) and were greater ($P<0.05$) at 271 than at 232 d, but FB was the only significant source of variation in cotyledon weight, RNA, DNA, or protein. Results demonstrated that maternal uterine environment influences fetal growth and suggests those influences are mediated, in part, by growth and function of placentomal tissues and uterine blood flow.

Key Words: Bovine, Placenta, Blood flow

105   Evaluation of F_1 crosses of five *Bos indicus* breeds with Hereford for birth, growth, carcass, cow productivity and longevity traits. J. Sanders*[1], D. Riley[2], J. Paschal[1], and D. Lunt[1], [1] *Texas Agricultural Experiment Station*, [2] *United States Department of Agriculture, Agricultural Research Service, Subtropical Agricultural Research Station*.

Birth, growth, carcass and cow productivity traits were evaluated in cattle out of Hereford cows and by Angus (A), Gray Brahman (B), Gir (G), Indu Brazil (I), Nellore (N) and Red Brahman (R) bulls. A sired calves had the shortest and N the longest (p<.05) gestations (282 and 294 d); others ranged from 289 to 291. A had lower (p<.05) birth wt (32 kg) than all except G (33), which were lightest of the Zebu (Z) crosses; I (39) were higher than all except R (37). R and B had higher (p<.05) weaning wt (214 and 213 kg) than G and A (198 and 199); I and N were intermediate. Yearling wt off pasture was lowest for A (231 kg) and was higher (p<.05) for R and B (271 and 270) than for N, I and G (258, 255 and 249). Yearling ht was lowest (p<.05) for A (110 cm). Among Z crosses, N (122) were taller than G (119). Feedlot gain for steers did not differ (p>.05) by breed and ranged from 1.47 kg/d in G to 1.6 in B and I. Marbling score was highest (p<.05) for A (Sm 10); among Z crosses, marbling did not differ and ranged from Sl 44 to Sl 54. Carcass wt was higher (p<.05) for R (307 kg) than for A (276). Ribeye area did not differ and ranged from 76 to 78 cm^2. Yield grade was lower (p<.05) for I (2.3) than for B (2.8); others were intermediate. Crossbred cows were bred to different breeds of bulls in different yr; breed of service sire was confounded with yr. Birth wt for calves out of A sired cows (39 kg) was heavier (p<.1) than for those out of G and N (35 and 37); others were intermediate. Weaning wt for calves out of Z crosses did not differ and ranged from 256 to 261 kg; all were heavier than those out of A (227). Cow wt at 7 yr was higher for I, R and B (572 to 586 kg) than for A (521); others were intermediate. All Z crosses were taller (p<.05) at 7 yr than A (125 cm). I sired cows (138) were taller than G (134); others were intermediate. Calf crop weaned for N crosses (96%) was higher (p<.1) than for I, A and R (81, 83 and 86); B and G were intermediate (88 and 92). Survival to 14 yr was higher (p<.05) in N (80%) than in I (33) and R (43). A, B, and G were intermediate (53, 53 and 73).

106   Evaluation of Brahman and tropically adapted *Bos taurus* breeds in the humid subtropics. C. C. Chase, Jr.*[1], D. G. Riley[1], T. A. Olson[2], and S. W. Coleman[1], [1] *USDA, ARS, Subtropical Agricultural Research Station*, [2] *University of Florida*.

Classic studies conducted in the 1960s between Brooksville, Florida and Miles City, Montana clearly established the presence of genotype by environment interactions. Those researchers concluded that the advantages of local over introduced lines were large enough to be of great economic significance in commercial beef production. Matching cow type to the environment in which she is asked to perform is an important consideration particularly in harsh climates. Environment, however, is not simply related to geography or climate but also includes nutrition, disease, and pest prevalence. Brahman cows of small, medium, and large frame sizes were bred to like frame size bulls. Weaning rate was considerably lower for large frame size first-parity and second-parity dams compared to small and medium frame size dams. This was due to poor calf survivability for large frame size first-parity dams and to low conception for large frame size second-parity dams. Weaning rates did not differ among frame sizes in third or greater-parity dams. Although the Brahman is undoubtedly adapted to the tropics there are tropically adapted *Bos taurus* breeds that may offer other attributes for southern US cattle production. In crossbreeding studies between Senepol and Hereford, significant levels of heterosis were observed for preweaning calf performance and feedlot performance of steers. Breedtypes did not differ for USDA yield and quality grades or Warner Bratzler shear force. A more recent study evaluated maternal and reproductive performance of Brahman x Angus, Senepol x Angus, and Tuli x Angus cows. Tuli x Angus cows had similar calf crop born and weaned as Brahman x Angus cows. Reproductive and maternal performance of Tuli x Angus cows were comparable to Brahman x Angus cows except for calf weaning weight and some calving difficulty. Most recent studies have evaluated the Romosinuano, a tropically adapted *Bos taurus* breed native to Colombia. Earlier studies showed that Romosinuano bulls and heifers reach puberty at relatively young ages similar to Angus. Currently a diallel breeding scheme among Angus, Brahman, and Romosinuano is being conducted.

Key Words: Cattle Breeds, Subtropics, Adaptation

107 Lifetime performance and efficiency of F[1] tropically adapted beef cattle breeds x Angus in arid rangeland. J. Holloway*[1], B. Warrington[1], D. Forrest[2], R. Randel[3], and C. Long[3], [1] *Texas Agricultural Experiment Station,* [2] *Texas A&M University,* [3] *Texas Agricultural Experiment Station.*

Lifetime performance (growth, pregnancy, lactation and longevity records through 7 calf crops) was evaluated for 252 F[1] cows: 93 Brahman-, 73 Senepol- and 86 Tuli-Angus F[1] females born in February-April and weaned in October of 1992-1995. All females were bred to calve at two yrs of age and maintained on south Texas rangeland (herbage allowance of 800 to 1,400 kg DM per 100 kg BW; annual rainfall 571 mm [427 to 633 mm]). A total of 1473 calf records were evaluated: 468 collected before maturity (1st 3 calf crops sired by Hereford bulls); 1,005 after maturity (4 calf crops sired by Bonsmara, Braunvieh, Tuli, Wagyu bulls used in certain yrs stratified across all F[1] breeds within yr). Birth dates and weights (only for first calf) and weaning measurements: weights, palpated pregnancy rates, BCS and frame score were recorded. F[1]'s were supplemented with 20 % C.P at 0.9-1.4 kg/cow/d for 100 d each winter. Females were not culled until after the 3rd parity and then only if they were dry in the fall and palpated open. The model for F[1] preweaning performance was Y=yr, day of age, sire breed, age of dam, and sire breed x yr; for F[1] productivity was Y=yr, pregnancy status, sire breed, sire breed x yr. Calving difficulty and pregnancy data were analyzed with the model: Y= yr, sire breed (chi-square). Lifetime production efficiency for the Brahman-, Senepol-, and Tuli-Angus F[1]'s was 40.69, 38.73, and 42.29 kg weaned calf/100 kg cow exposed. Even though the Tuli F[1]'s weaned smaller (P<0.05) calves than Brahman and Senepol F[1]'s (224.7 vs. 242.0 and 222.0 kg), they had higher (P<0.05) reproductive rates as 2-yr olds (75.6 vs 61.3 and 75.3%) and as 3-yr olds (73.1 vs 68.5 and 66.2) and had smaller (P<0.05) mature weights (452 vs 532 and 494 kg at 5.5 yr) and thus had higher (P<0.05) lifetime efficiencies. Senepol F[1]'s had greater (P<.05) calving difficulty than Brahman and Tuli F[1]'s (16.2 vs 8.7 and 9.5% having difficulty) and thus weaned a smaller (P<0.05) calf crop and had lower (P<0.05) reproductive rates in their 2nd parity than Tuli F[1]'s. Thus, Senepol f1's had the lowest (P<0.05) lifetime efficiencies.

Key Words: Subtropical Breeds, Adaptation, Lifetime Performance

108 Evaluation of the F[1] crosses of the Tuli, Boran, and Brahman with Hereford and Angus for birth, growth, carcass, cow productivity and longevity characteristics. J. Sanders*[1], S. Cunningham[1], A. Ducoing[2], A. Herring[1], and D. Lunt[1], [1] *Texas Agricultural Experiment Station,* [2] *Universidad Nacional Autonoma de Mexico.*

Birth, weaning, growth, carcass, tenderness, and cow productivity traits were evaluated in cattle born in 1992 and 1993, out of Hereford and Angus cows and by Tuli (Tu), Boran (Bo), and Brahman (Br) bulls. Gestation length did not differ (p>.05) by sire breed but was 287, 290 and 289 d for the Tu, Bo, and Br crosses. Tu sired calves had the lowest (p<.05) birth wt (36.4 kg) and Br the highest (44.0); Bo crosses averaged 40.3. All three sire groups also differed (p<.05) for cannon bone length at birth and ranked the same as for birth wt (28.5, 29.4 and 31.0 cm for the Tu, Bo, and Br crosses). Br crosses had the highest (p<.05) weaning wt (234 kg); Bo and Tu did not differ (217 and 209). All three crosses differed (p<.05) for weaning hip ht and ranked the same as for cannon bone length at birth (108.7, 110.3 and 115.9 cm). Feedlot gain for steers was highest (p<.05) for Br crosses (1.33 kg/d) and did not differ between Tu and Bo (1.18 and 1.12). Marbling score was higher (p<.05) for Tu (Sl 51) than for Br (Sl 24); Bo crosses were intermediate (Sl 45). Carcass weight was highest (p<.05) for Br crosses (311 kg) and did not differ between Tu and Bo (276 and 273). Ribeye area and yield grade did not differ and ranged from 73 to 75 cm^2 in Bo to Br and from 3.0 to 3.2 in Tu and Br crosses, respectively. Warner-Bratzler shear force was lower (p<.05) for Tu (3.32 kg) than for Bo crosses (3.76); Br were intermediate (3.59). Crossbred cows were bred to different breeds of bulls in different years; breed of service sire was confounded with yr. Birth wt for calves out of crossbred cows did not differ and ranged from 35.2 to 35.6 kg in the Bo and Tu crosses. Calves out of all three groups of cows differed (p<.05) for weaning wt (232, 219 and 204 kg for those out of Br, Bo and Tu crosses). Mature cow wt was 601 ± 7, 514 ± 10 and 513 ± 8 for the Br, Bo, and Tu crosses; condition scores were 5.9, 6.2 and 5.6, respectively. Calf crop weaned was 88.1 ± 2.1, 85.3 ± 1.8 and 83.4 ± 1.7 for the Bo, Tu and Br crosses. Percentages of cows remaining in the herd are 69, 50, and 51 for the Bo, Tu and Br crosses.

109 Performance of tropically adapted breeds in a temperate environment: Calving, growth, reproduction and maternal traits. L. V. Cundiff*, *U. S. Meat Animal Research Center, ARS, USDA.*

Results will be reviewed from an analysis of data for 8,484 calves produced in the Germplasm Evaluation (GPE) Program at MARC. Although the analysis involved progeny of 27 sire breeds, this report will focus on comparisons among progeny sired by tropically adapted breeds including Brahman (Bh) and Sahiwal (Sw) in Cycle III (1973-1974); Nellore (N) and Longhorn (Lh) in Cycle IV (1986-1990); Bh, Boran (Bo), and Tuli (Tu) in Cycle V (1992-1994); and Beefmaster (Bf), Brangus (Ba), Bonsmara (Bs), and Romosinuano (Ro) in Cycle VIII (2001-2002). Hereford (H) and Angus (A) sires provided ties for pooling data over cycles for least squares analyses using a model that included random effects for sire in breed, and fixed effects for sire breed, dam breed, sex, cow age, birth year, and sire breed-dam breed interaction. Data obtained on three-way cross progeny by Red Poll (Cycle IV and V) sires for calvings unassisted, birth weight, and weaning weight were similarly analyzed. Bos indicus sired progeny had heavier birth weights and required more assistance at calving than progeny of other breeds; however, birth weights were significantly heavier in H and A sired females than in those by other breeds, and N, Bh, Sw, and Lh females required less assistance at calving than those by other breeds. Growth rates, during summer months, to weaning ages were greater for B and N sired progeny than for Bo, Sw, A, and H sired progeny, which were in turn greater than for Tu or Lh sired progeny. However, weights at yearling ages (400 or 550 d), affected by growth rate during winter months, were heavier for progeny of Bf, Ba, A, and H sires than N, Bo, and Bh sires which were in turn heavier than for Ro, Tu, or Lh sires. Age at puberty was significantly younger for Lh, Tu, Ba, Bf than for N and Bh sired females, intermediate for Ro and Bo which were not significantly different from any other breed except A and H which were youngest. Progeny of Bh and N sired females were heavier at weaning than those of other tropically adapted breeds and A and H sires.

Key Words: Beef Cattle, Breeds, Tropically Adapted

110 Feed utilization and performance of tropically adapted cattle. C. L. Ferrell*, T. G. Jenkins, and H. C. Freetly, *USDA-ARS, U.S. Meat Animal Research Center.*

Four studies were conducted to evaluate tropically adapted breeds for feed utilization and energy use during growth. In study 1, 10 *Bos indicus* (5 Boran, Bo; 5 Brahman, Br) sired and 10 MARC III steers were used in a 2 × 2 factorial design to assess cattle age and breed influence on digestion of a high grain diet. Duodenal flows of total N, microbial N, nonmicrobial N, total amino acids, and total tract N digestibility were not different (P>0.05) due to age or breed. In study 2, (21), $\frac{1}{2}$ (7), and (9) Br were compared to MARC III (14) steers fed bromegrass hay or corn silage diets during a 119 d period. Br crosses ate less (6.62 vs. 7.41 kg/d) and grew slower (0.62 vs. 0.72 kg/d) than MARC III (P<0.05), but ME/gain was similar (35.2 vs. 31.1 Mcal/kg; P=0.40). When subsequently fed a high-corn diet, daily DM intake (7.63 vs. 8.49) and ADG (1.18 vs. 1.32 kg/d) were lower (P<0.05) for Br steers. Br and MARC III had similar ME/gain during finishing (20.2 vs. 20.2 Mcal/kg; P=0.98) and for the entire study (21.6 vs. 21.4; P=0.79). Influences of Angus (A), Bo, Br, Hereford (H), and Tuli (T) sires on body composition and energy use during finishing was evaluated in study 3. Feed intake was least for Bo- and T-, intermediate for Br- and H-, and greatest for A-sired steers. Rates of weight, fat, and energy gains were similar for A-, H-, and Br-sired steers, but less (P<0.01) for Bo and T when fed ad libitum. Liver weights differed (P<0.01) among sire breeds (6.33, 4.55, 5.06, 6.09, and 4.87 kg for ad libitum fed A, Bo, Br, H, and T) and increased in response to increased daily feed intake in H (0.65), A (0.55), Bo (0.47), Br (0.38), and T (0.40). Maintenance and efficiency of energy use for gain differed (P<0.05) among sire breeds. In study 4, fasting heat production (FHP) at 30 wk of age was highest for MARC III heifers and decreased as Br increased (0, , $\frac{1}{2}$,). FHP decreased with aging, but the rate of decrease followed the same ranking, resulting in similar values at 86 wk. A number of differences between tropically and temperately adapted cattle were observed, but efficiency of feed use was similar.

Key Words: Efficiency, Maintenance, Digestibility

111   Carcass and meat traits of tropically-adapted breeds. T. Wheeler*, S. Shackelford, and M. Koohmaraie, *U.S. Meat Animal Research Center.*

Tropically adapted breeds from the U.S., South America, and Africa have been evaluated at the U.S. Meat Animal Research Center. The breeds have included: Brahman, Brangus, Beefmaster, Boran, Tuli, Bonsmara, Nellore, Sahiwal, and Romosinuano. Because tropical adaptation is necessary in some areas of the U.S. and because *Bos indicus* breeds produce less tender meat on average than *Bos taurus* breeds, we have evaluated these breeds in search of germplasm that could be incorporated into U.S. beef production to maintain the advantages of *Bos indicus* while improving meat tenderness. Relative to Hereford × Angus crosses, progeny of Brahman, Beefmaster, and Brangus sires were similar in carcass weights, had slightly lower fat thickness, lower marbling scores, and similar longissimus areas, except Brangus had slightly larger longissimus area. Brahman crosses had greater retail product yield whereas Beefmaster and Brangus crosses were similar to Hereford × Angus crosses. Brahman and Beefmaster progeny had less tender longissimus than Hereford × Angus crosses whereas Brangus progeny had a tendency to be slightly less tender. Compared to Hereford × Angus crosses, Sahiwal and Nellore progeny were similar in carcass weights, had lower fat thickness, higher retail product yields, lower marbling scores, and much less tender longissimus. Relative to Hereford × Angus crosses, Tuli and Boran progeny had lighter carcass weights, similar longissimus areas and retail product yield. Tuli had lower fat thickness but similar marbling scores whereas Boran had similar fat thickness and lower marbling scores compared to Hereford × Angus crosses. Tuli crosses had similar and Boran crosses had lower longissimus tenderness than Hereford × Angus crosses. Bonsmara and Romosinuano crosses had lighter carcass weights, lower fat thickness, slightly larger longissimus areas, greater retail product yields, lower marbling scores, and similar longissimus tenderness relative to Hereford × Angus crosses. This project has identified three sources of tropically adapted germplasm (Tuli, Bonsmara, and Romosinuano) that do not compromise longissimus tenderness, but have the disadvantage of slower growth rate.

Key Words: Beef, Breeds, Tenderness

112   Cow efficiency during the preweaning period of tropically adapted cattle. T. G. Jenkins* and C. L. Ferrell, *USDA-ARS, U.S. Meat Animal Research Center.*

Measures of productivity of mature tropically adapted F_1 cows produced by mating Angus and Hereford, Brahman (Cycle III and VI) and Sahiwal (Cycle III), Nellore (Cycle IV), and Boran and Tuli (Cycle V) sires by AI or natural service to Angus and Hereford cows (AH). Comparisons were relative to Angus/Hereford F_1s. Cycle III cow's daily rations were adjusted biweekly to achieve weight stasis for a 126 d test period. For other Cycles, individual cows were randomly assigned to a diet at one of three feeding rates, 140, 180 or 240-kcal ME/weight$^{0.75}$ (Cycle IV) or 132, 189- kcal ME/weight$^{0.75}$ or ad libitum (Cycle V). Daily milk yields were recorded via weigh-suckle-weigh. Brahman and Sahiwal cows produced significantly more total lactation yield (TY), weight of calf weaned (WCW) and were more efficient (Eff, weight calf weaned/feed consumed by cow). These breed crosses exhibited 15.2% and 11.8% more TY, 18.8% and 13.1% more WCW and were 3.8% and 7.2% more Eff relative to AH cows (802 kg, 200 kg, 38.5 Eff). In Cycle IV, Nellore TY and WCW was greater ($P < 0.05$). Nellore crosses produced 4.8% more TY, 20% more WCW and were 14.2% more Eff at DMI for maximum weaning weight than AH (789 kg, 121 kg, 28 Eff). Cycle V mean TY for Brahman was greater ($P < 0.05$) than Tuli but neither differed ($P > 0.10$) from AH or Boran cross cows. Relative to AH (1686 kg), Brahman, Boran and Tuli produced 6.9% and 1.9% more and 9.1% less TY; respectively. WCW of Brahman and Boran was greater ($P < 0.05$) than Tuli or AH which did not differ ($P > 0.10$). Brahman, Boran and Tuli produced 25.0%, 19.2%, and 4.2% more WCW than AH (169.4 kg). Brahman and Boran Eff exceeded ($P < 0.05$) Tuli which was greater ($P < 0.05$) than AH. Relative to Angus/Hereford (72.6), Brahman, Boran and Tuli F_1s were 45%, 35%, and 15%; respectively, more Eff. Tropically adapted F_1 cows mated to *B. taurus* sires were more effective in converting food resources to weight of calf at weaning during the preweaning period during spring and summer months of a temperate climate.

Key Words: Lactation, Preweaning, Weaning weight

113   Foraging behavior of tropically adapted breeds. D. Forbes*, *Texas Agricultural Experiment Station.*

Cattle production in the southern United States is heavily dependent on tropically-adapted animals, particularly those of Brahman breeding. The fact that feeder calves of overt Brahman influence are often discounted by cattle buyers has led some in the industry to look for alternative tropically adapted germplasm. Three breeds have dominated the search for alternatives: the Senepol, the Tuli, and the Bonsmara. Most research with these breeds has concentrated on comparative reproductive performance and carcass characteristics and quality; only a limited amount of research has examined forage intake and grazing behavior. Foraging behavior (bite size, bite rate, and grazing time) has an important influence on forage intake and is heavily influenced by sward structure and environmental conditions. In environments where day-time temperatures are high, non-adapted animals respond by seeking shade, and increasing night-time grazing. However, if night-time temperatures and particularly night-time heat index values remain high, overall grazing time declines. In studies in east and southwest Texas, Tuli-sired heifers had similar grazing times to Brahman cattle, and showed few of the behavioral changes adopted by purebred Angus heifers. *Bos indicus* cattle have smaller digestive tracts and faster passage rates of digesta than *Bos taurus* cattle, with crossbred animals such as Tuli x Brahman being intermediate. Heat stress induced reduction in grazing time combined with poor-quality forage results in depressed intake. Senepol cattle appear to show a similar intermediate response in grazing time. There are no published foraging behavior data for Bonsmara cattle in the US. However, in a recent study comparing Angus, Brahman x Angus, Bonsmara and Braunvieh steers grazing cool-season forage in east Texas, Brahman steers had the highest intakes, followed by Bonsmara, Braunvieh, and Brahman x Angus, with Angus steers having the lowest intakes (20.2, 18.2, 16.2, 15.3 and 13.4 g DM/kg BW, respectively. SEM 0.598). While foraging behavior studies provide valuable insights into differences in performance between breeds, labor costs will likely preclude much further work of this type.

Key Words: Grazing Time, Intake, Bos Indicus

114   Evaluation of Boran, Tuli, Gelbvieh, and Brahman F1 crosses in Oklahoma. W. A. Phillips*[1], R. P. Wettemann[2], S. W. Coleman[3], and J. W. Holloway[4], [1]*USDA-ARS Grazinglands Res Lab,* [2]*OK Agric. Exper. Sta.,* [3]*USDA-ARS Subtropical Ag. Res Sta.,* [4]*Texas A&M Res and Ext Center.*

Genetic adaptation to a hot climate is an important component of cow/calf breeding systems used in the Southern Great Plains region. The objective of this experiment was to evaluate F1 calves sired by exotic, tropically adapted *Bos indcius and Bos taurus* breeds (Boran and Tuli) and compare them to the Brahman (*Bos indicus* tropically adapted) and Gelbvieh (*Bos taurus* temperately adapted) bulls and the productivity of the F1 females resulting from these crosses under typical Oklahoma beef management practices. Angus and Angus x Hereford cows were bred by AI to Boran, Tuli, Brahman or Gelbvieh bulls in the spring (1991 through 1994) to produce F1 calves (N=173). Tuli-sired calves were lighter ($P < 0.01$) at birth (35.4 kg) than Boran- (39.9 kg), Gelbvieh- (39.6 kg), and Brahman-sired (41.4 kg) calves. Brahman-sired calves were heavier ($P < 0.01$; 223 kg) at weaning (205 d) than Boran- (203 kg), Tuli- (196 kg), and Gelbvieh-sired (210 kg) calves. Preweaning ADG was also greater ($P < 0.01$) for the Brahman-sired calves as compared to the other three sire breeds (0.89 kg vs 0.80 kg). Subsequent performance of the F1 females were observed for 6 calving cycles (276 cow-calf records), bred first to Red Poll and subsequently to continental bulls. Calves from Boran-, Tuli-, and Brahman-sired cows were lighter ($P < 0.01$) at birth than calves from Gelbvieh-sired cows (36.8 kg vs 40.9 kg). Calves from Brahman- and Boran-sired cows had similar BW and were heavier ($P < 0.01$) at weaning than calves from Tuli- and Gelbvieh-sired cows (231 kg vs 210 kg). Average BW of cows sired by Brahman bulls was greater ($P < 0.01$) than the BW of cows sired by Boran and Tuli bulls (566 kg vs 501 kg). Boran-sired cows weaned more calf as a percentage of BW than cows sired by Brahman, Tuli and Gelbvieh bulls (45% vs 42%). Tuli sired cows were smaller, but produced as much calf per 100 kg of BW as Brahman-sired cows. Boran-sired cows were moderate in BW and produced more calf per 100 kg of BW than any of the sire breeds evaluated.

Key Words: Birth Weight, Weaning Weight, Sire Evaluation

115   Genotype x environment interactions in Brahman, Angus, and reciprocal-cross cows and their calves. M. Brown*[1] and H. Brown, Jr.[2], [1]*USDA-ARS, Grazinglands Research Laboratory*, [2]*University of Arkansas.*

Stability of direct and maternal breed effects and individual and maternal heterosis across forage type was evaluated in a diallel of Brahman and Angus using preweaning data from 486 purebred and reciprocal-cross calves, milk yield and quality data from 139 purebred and reciprocal-cross cows, and reproductive and preweaning data on 190 purebred and reciprocal cross cows and their 434 Hereford-sired calves. Cows and calves were managed on either common bermudagrass (BG) or endophyte-infected tall fescue (E+) from 1985-1994; a combination of the two forages was included from 1995-1997. Calves were spring-born and not creep-fed. Milk yield was estimated by machine milking and milk quality was evaluated in a commercial laboratory. Direct heterosis for birth weight (BW), 205-d weight (WWT), weaning hip height (WHT), and weaning weight:height ratio (WWT/WHT) was important (P < 0.01) and consistent across forage type. Direct effects for WHT were larger in calves on BG than E+. Direct heterosis for milk yield was higher on BG than E+ (P < 0.10). Maternal breed effects for milk yield favored Angus on BG (P < 0.05) but not E+, whereas direct breed effects were similar on both forages and favored Brahman. Direct heterosis for calving rate was larger on E+ than BG or the forage combination (P < 0.05), whereas maternal effects were larger on BG than on the forage combination (P < 0.10). Maternal heterosis for BW was negative on BG (P < 0.11) but positive on E+ and the forage combination (P < 0.10). Heterosis for WWT per cow exposed was substantial on all forages (P < 0.01) and was greater on E+ (P < 0.01) than BG or the forage combination. These data indicate: 1) direct heterosis for preweaning traits was relatively stable across the two forage types but maternal and direct breed effects may vary with forage type, 2) heterosis for milk yield is larger on BG than tall fescue and 3) more advantage to Brahman-cross cows over purebreds on tall fescue than BG.

Key Words: Genotype x Environment, Beef Cattle, Forage

116   Varying differences between sexes in birth weight and weaning weight of calves sired by tropically adapted breeds at six diverse U.S. locations. A. D. Herring*[1], S. F. Cunningham[1], L. V. Cundiff[2], C. C. Chase, Jr.[3], J. O. Sanders[1], W. A. Phillips[4], J. F. Baker[5], J. W. Holloway[6], B. G. Warrington[6], and S. W. Coleman[4], [1]*Texas A&M University,* [2]*USDA-ARS,* [3]*USDA-ARS,* [4]*USDA-ARS,* [5]*University of Georgia,* [6]*Texas Agricultural Experiment Station.*

In the early 1990s, a joint effort to evaluate several tropically adapted breeds through production of F1 calves was initiated at Brooksville, FL, Clay Center, NE, El Reno, OK, McGregor, TX, Tifton, GA and Uvalde, TX. Sire breeds (at number of locations) evaluated were Brahman (Br; 6), Boran (Bo; 3), Tuli (Tu; 6), Senepol (Se; 2), Angus (An; 2) and Hereford (He; 2). Sires in each breed were used at multiple locations. Location was partly confounded with age of dam and breed type of dam. Records from first parity cows were excluded. Each location used An purebred and/or crossbred cows, but some locations used only purebred An or An and He cows or only crossbred cows. Only F1 calves from Bos taurus dams were included in this analysis. Weaning weights were adjusted to 205 d basis. Birth weight (BWT) and 205-d weaning weight (WWT) were analyzed through mixed model procedures in SAS. Fixed, independent variables were sire breed (SB), location (LOC), age of dam, birth year, calf sex (SEX), SB x LOC, SB x SEX, and SB x LOC x SEX. The regression on birth date (BDATE) within year-LOC combination was included for BWT and WWT, and sire nested within SB was included as a random effect. All independent effects except birth year accounted for significant variation in BWT and WWT. The regression on BDATE within year-LOC ranged from .10 kg/d to -.01 kg/d for BWT and from .39 kg/d to -.15 kg/d for 205-d WWT. Previous reports have found a SB x SEX interaction for BWT and WWT when Bos indicus (Bi) and Bos taurus (Bt) sires are bred to Bt dams where males are much heavier than females when sired by Bi vs Bt breeds. This same trend is documented here across locations. The SEX difference in BWT (kg) across LOC-SB combinations ranged from 3.5 to 7.5 for Br, 2.2 to 6.0 for Bo, 2.3 to 6.4 for Tu, 1.9 to 2.4 for Se, 2.7 to 3.4 kg for He, and 3.5 to 4.7 for An. The SEX difference in 205-d WWT (kg) across LOC-SB combinations ranged from 8.3 to 27.9 for Br, 9.0 to 19.1 for

Bo, 6.4 to 37.8 for Tu, 1.1 to 15.9 for Se, 1.7 to 10.7 kg for He, and 18.5 to 27.9 for An.

Key Words: Genotype x Environment Interaction, Birth Weight, Weaning Weight

117   Genetic (co)variances for growth, carcass, and tenderness traits of Brahman steers. T. Smith*[1], J. Domingue[1], T. Bidner[1], J. Paschal[2], G. Whipple[3], and D. Franke[1], [1]*LSU Agricultural Center,* [2]*Texas A&M University,* [3]*University of Nebraska.*

The Brahman breed has contributed significantly to cow-calf production in the Gulf Coast Region, however carcass characteristics are less desirable. Purebred Brahman bull calves (n=430) were purchased at weaning from private producers in Louisiana (1996 through 2000) to evaluate genetic (co)variation for growth, carcass, and tenderness traits. The calves were sired by 68 bulls. After purchase, calves were castrated, dewormed, vaccinated, and backgrounded. Steers grazed ryegrass for an average of 120 days over the five yr. In April of each yr the steers were shipped to south Texas for feeding. Steers were harvested when about a third of the pen averaged 500 to 575 kg BW and 7 to 10 mm backfat. Carcasses were electrically stimulated with high voltage and chilled for 24 hr. A 15-gm 24-hr postmortem longissimus muscle sample was taken for calpastatin assay. A primal rib was purchased and 2.54 cm-thick steaks cut for 7- and 14-d aging. Steaks were cooked to an internal temperature of 70° C. Tenderness was determined by averaging the force required to shear six 1.25 cm cores taken parallel to muscle fibers. An animal model was used to estimate genetic (co)variances to calculate heritability and genetic correlations. A total of 2,155 animals was included in the A-matrix. Heritability estimates (± se) were .33(.14) for feedlot adg, .56(.15) for hot carcass weight, .51(.16) for ribeye area, .38(.17) for fat thickness, .49(.17) for yield grade, .38(.16) for marbling score, .21(.11) for 14-d shear force, and .49(.17) for calpastatin assay. Most genetic correlations were less than .25. Exceptions were .54(.18) for adg and hot carcass weight, and -.63(.25) for yield grade and 14-d shear force. Sire EPDs for all traits were generally normally distributed and ranged about two genetic standard deviations about the mean EPD. These genetic parameters suggest sufficient genetic variation for response to selection.

Key Words: Brahman, Carcass, Genetic Parameters

118   Evaluation of heterosis retention for cow productivity traits in *Bos indicus/Bos taurus* crosses. J. Sanders*[1], K. Key[1], D. Riley[2], and D. Lunt[1], [1]*Texas Agricultural Experiment Station,* [2]*United States Department of Agriculture, Agricultural Research Service, Subtropical Agricultural Research Station.*

Heterosis and heterosis retention for cow reproduction and maternal traits are being evaluated in Brahman (B), Angus (A), Nellore (N), Hereford (H), and various crosses involving these breeds. Calf crop born for B, A, and H cows has been .68 ± .03, .93 ± .03, and .80 ± .03, respectively. BA and BH F$_1$ averages have been .90 ± .03 and .89 ± .02, giving heterosis estimates of .095 and .15. BA and BH F$_2$ averages have been .74 ± .03 and .87 ± .03, giving heterosis estimates in the F$_2$ of -.065 and +.13. Average calf crop weaned for B, A, and H cows has been .59 ± .03, .83 ± .04, and .72 ± .04, respectively. BA and BH F$_1$ averages have been .82 ± .03 and .82 ± .02, giving heterosis estimates of .11 and .155. BA and BH F$_2$ averages have been .64 ± .04 and .81 ± .04, giving heterosis estimates in the F$_2$ of -.060 and +.145. Reciprocal BH F$_1$ calves were produced, allowing estimates of heterosis for calf survival and weaning weight. Survival rates in straight B and H calves were .79 ± .03 and .91 ± .03. Survival rates in H sired calves out of B cows and B sired calves out of H cows were .95 ± .03 and .98 ± .09, respectively, giving a heterosis estimate of .115 for direct effects. Calf survival in BH F$_2$ calves (reciprocals combined) was .98 ± .09. This gives an estimate of .13 for the combination of maternal heterosis plus retained heterosis for direct effects on calf survival. Weaning weights in B and H calves were 209.4 ± 4.5 and 175.6 ± 4.9 kg. Weaning weights in H sired calves out of B cows and B sired calves out of H cows were 224.8 ± 4.8 and 204.2 ± 9.8, respectively, giving a heterosis estimate of 22 kg for direct effects. Weaning weight in BH F$_2$ calves (reciprocals combined) was 218.2 ± 3.6, giving an estimate of 25.7 kg for the combination of maternal heterosis plus retained heterosis for direct effects on weaning weight. Average cow weight at four yr of age for B, A, and H

cows was 505 ± 10, 519 ± 14, and 479 ± 11 kg, respectively. BA and BH F_1 averages were 535 ± 11 and 524 ± 17, giving heterosis estimates of 23 and 33 kg. BA and BH F_2 averages were 494 ± 14 and 534 ± 14, giving heterosis estimates in the F_2 of -18 ± 14 and $+42 \pm 14$.

119 Direct and maternal breed additive and nonadditive genetic effects for reproductive, growth, and carcass traits in Brahman crossbred cattle.

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Direct and maternal breed additive and nonadditive genetic effects were estimated for reproductive, preweaning, and carcass traits in a four-generation rotational crossbreeding scheme involving Angus (A), Brahman (B), Charolais (C), and Hereford (H) breeds. Two-, three-, and four-breed combinations were involved with the restriction that each breed combination include B, a breed considered tropically adapted to the Gulf Coast Region. Breed additive and nonadditive genetic effects were estimated with a linear fixed model that included non-genetic effects of year of record, age of cow, and calf gender (when appropriate) and fractions of genes from breeds in individuals and dams and fractions of gene pairs in individuals and dams with different breed combinations as linear covariances. The B direct genetic effect significantly decreased weaning rate, hot carcass weight, ribeye area, fat thickness, and marbling score, and significantly increased calving date, birth weight, and shear force. The A direct genetic effect significantly decreased hot carcass weight, ribeye area, and shear force, and significantly increased fat thickness and marbling score. The C direct genetic effect significantly increased calving assistance, birth weight, weaning weight, hot carcass weight, ribeye area, and significantly decreased fat thickness. The H direct genetic effect significantly increased birth weight and fat thickness and significantly decreased ribeye area and shear force. Significant and positive non-additive genetic effects existed for A-B, B-C and B-H breed combinations for weaning rate, weaning weight, hot carcass weight and ribeye area, whereas significant negative non-additive genetic effects existed for shear force. It is clear in these data that the tropically adapted B had lower reproductive and growth potential than less adapted breeds but excelled when crossed with the less adapted breeds in reproduction, maternal traits, and some carcass traits.

Key Words: Brahman, Production, Genetic effects

120 Carcass and meat characteristics of Bonsmara-influenced cattle.

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Bonsmara cattle, tropically adapted *Bos taurus* cattle from South Africa, have been evaluated for carcass and meat characteristics for incorporation into US beef production systems. It is hypothesized that Bonsmara cattle fed fewer number of days in the feedlot on a high concentrate diet will produce tender meat while simultaneously possessing heat and disease resistance similar to *Bos indicus* -influenced cattle. Three major studies have been conducted by Texas Agricultural Experiment Station scientists. The 1st study evaluated the effect of length of post-weaning forage feeding and days on a high concentrate diet on live animal growth, feed efficiency, carcass characteristics, palatability, Warner-Bratzler shear force, and carcass meat yield. Steers (n=160) were selected across 14 ranches in South Africa and allotted across source, sire and initial weight to seven feeding regimes at the Animal Nutrition and Animal Products Institute in Irene, South Africa. The 7 feeding treatments were: 1) short concentrate feeding to 300 kg live weight; 2) concentrate feeding to 400 kg; 3) concentrate feeding to 500 kg; 4) high forage diet for 100 days followed by concentrate feeding to 400 kg; 5) high forage diet for 100 days followed by concentrate feeding to 500 kg; 6) high forage diet for 200 days followed by concentrate feeding to 400 kg; 7) high forage diet for 200 days followed by concentrate feeding to 500 kg. A 2nd study utilized Bonsmara x Angus steers (n=207) fed a high concentrate diet at a commercial feedlot in Hereford, TX. Feedlot weight gain, carcass characteristics, and Warner Bratzler shear force values were determined after cattle had reached a fat endpoint of .76 cm at the 12th rib. Steers were harvested in two groups (n=161 in Group 1; n= 46 in Group 2) at Excel Corporation, Plainview, TX. A 3rd study was similar to the 2nd study, except cattle (n= 156) were Beef Master x Bonsmara steers and steers were fed in south Texas and harvested at Sam Kane Beef Processors. Results of these studies will be discussed.

Key Words: Bonsmara Cattle, Carcass Characteristics, Tenderness

Ruminant Animal Production

121 Relationship of prepartum concentrations of insulin-like growth factor-I (IGF-I) in cows with birth weight, concentrations of IGF-I, and weaning weights of calves.

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Objectives were to determine relationships between maternal concentrations of insulin-like growth factor-I (IGF-I) during gestation in grazing beef cows and subsequent calf birth weight, concentrations of calf IGF-I at birth, weaning weights of calves, and resumption of luteal activity (LA) in cows. Further, the effects of supplementation on maternal concentrations of IGF-I during gestation, and calf birth weight and weaning weight were investigated. Crossbred (#8804 3/8 *Bos indicus*) multiparous beef cows (n = 82) were assigned to one of six paddocks (two paddocks/treatment) of stockpiled fescue and fed either soyhulls (SH), corn:soybean meal (CSB), or not supplemented (C) at 0.91 kg/d from d 179 of gestation until approximately 60 d after parturition. Blood serum samples were collected from cows at 179 ± 2 d (BCS = 6.7 $\pm$ 0.1) and 207 ± 2 d (BCS = 6.9 $\pm$ 0.1) of gestation. Calf weight and a blood serum sample were obtained at birth. Concentrations of IGF-I were quantified in serum samples from cows and calves. Three weeks before the start of the breeding season, weekly blood samples were collected from cows and concentrations of progesterone were quantified to determine LA. Maternal concentrations of IGF-I at d 179 of gestation were not correlated (P > 0.10) with any calf parameters; however, maternal IGF-I at d 207 was positively correlated (r = 0.24; P < 0.05) with calf IGF-I at birth. Calf IGF-I at birth was negatively correlated (r = -0.27; P < 0.05) with adjusted weaning weight. Concentrations of IGF-I at d 179 or 207 of gestation was not correlated (P > 0.10) with resumption of LA in cows. Prepartum supplementation (CSB and SH)

tended (P = 0.10) to decrease maternal concentrations of IGF-I at d 207 compared with C cows. Prepartum supplementation did not influence (P > 0.10) the percentage of cows (BCS = 6.8) with LA at breeding, concentrations of calf IGF-I at birth, calf birth weight, or calf weaning weights. Reduced concentrations of IGF-I at birth in calves may help identify calves with increased weaning weights.

Key Words: Beef Cows, Insulin-Like Growth Factor-I, Weaning Weights

122 Effects of cool season annuals with legumes on wintering beef cows.

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This experiment was conducted from 2002 to 2004 to evaluate the effect of adding legumes to wheat and ryegrass grazing systems as a supplement to gestating beef cows. Sixty fall calving crossbred cows (588 $\pm$ 10 kg), starting September 2001, were divided into six groups stratified by breed, BCS, BW, and age and were assigned into one of the following six annual forage swards (0.45 ha/cow) interseeded into dormant bermudagrass/dallisgrass pastures: 1) wheat and ryegrass (WRG; control), 2) wheat and ryegrass plus red clover (WRR), or 3) wheat and ryegrass plus white and crimson clover (WRW). Wheat, ryegrass, and red, white, and crimson clover were seeded at rates of 101, 25, 9, 4 and 12 kg seed/ha, respectively. The WRG treatment was fertilized with 55 kg of N/ha from ammonium nitrate 3 wk after planting, in February, and in May; however, WRR and WRW were only fertilized after planting. Cow groups had ad libitum access to bermudagrass/dallisgrass hay (12% CP, 58% TDN) during the winter. Beginning the second week in December, cows were synchronized and on an observed estrus. On January 10, a bull was placed with each group for 60 d. Body weight and

BCS did not differ ($P > 0.30$) between cows grazing WRG versus WRR and WRW, or between cows grazing WRR versus WRW ($P > 0.30$). Calf birth weights and ADG did not differ ($P > 0.14$) between WRG versus WRR and WRW, nor were there differences ($P > 0.40$) between WRR and WRW. All forage combinations were effective in maintaining cow BW and BCS throughout the winter and spring months, and there seemed to be no beneficial effects in cattle performance associated with the additions of clover to the swards. Although there were no differences among treatments in cattle performance, WRR and WRW received 110 kg/ha of N less than WRG.

Key Words: Beef Cows, Legumes, Pastures

123 Perennial versus annual grasses as a supplement to gestating beef cows. S Hutchison*, S. A. Gunter, P. A. Beck, C. B. Stewart, J. D. Shockey, and J. M. Phillips, *Southwest Research & Extension Center, University of Arkansas, Hope.*

When limit grazing cool-season annuals as a winter supplement, research at the SWREC with gestating beef cows grazing complementary forage systems has shown that energy supplementation is not required and hay requirements are reduced 20%. To further improve the sustainability of a complementary forage system, replacing the annual grasses with a non-toxic cool-season perennial grass should be beneficial. On 17 December 2003, 138 beef cows (BW = 538 ± 11 kg) were divided into 6 groups of 23 stratified by BCS, BW, and age then assigned to graze a forage system containing 4.9 ha of bermudagrass plus either 2.4 ha of "Jesup" tall fescue infected with the AR542 endophyte (7 hr/d; 0.04 ha/cow/grazing-d), or 2.4 ha of "Wintergrazer 70" rye/"Passeral Plus" ryegrass (winter) and "Redriver" crabgrass (summer; 7 hr/d; 0.04 ha/cow/grazing-d) up to 3 d/wk when forage was available. All pastures had ad libitum access to bermudagrass/dallisgrass hay (9% CP; 54% TDN) from October through April. The rye/ryegrass was established by disking and broadcasting the seed (101 and 22 kg/ha of rye and ryegrass, respectively) into crabgrass pastures in the fall. On 2 May, an Angus bull was placed with each group of cows for 60 d and pregnancy was determined by rectal palpation at weaning on September 13. Grazing system had no affect ($P > 0.07$) cow BW or BCS at any point during the trial. Conception rate did not differ ($P > 0.99$) as a result of treatment with an average of 85.5% relative to the number of cows exposed. No differences ($P > 0.63$) were noted between calves on annual or perennial pasture in birth weight (33.1 vs 31.7 kg, respectively), weaning weight (225 vs 210 kg, respectively), ADG from birth until May (0.95 vs 1.00 kg, respectively), ADG from May until weaning (0.86 vs 0.82 kg, respectively), or weight per d of age (1.04 vs 1.04 kg, respectively) as a result of treatment. Cows grazing a complementary forage system with either the non-toxic perennial or annual grass performed similarly. Advantages for either system would result from differences in cost of production.

Key Words: Complementary Forages, Beef Cattle, Cool Season Annuals

124 Effects of beef cow parity on responses to early calf weaning. S. Galindo-Gonzalez*[1,2], J. D. Arthington[1,2], and A. De Vries[2], [1]*University of Florida, Range Cattle Research and Education Center,* [2]*University of Florida, Department of Animal Sciences.*

The objective of this study was to investigate the effect of early calf weaning from both primiparous and multiparous cows on measures of cow BW, BCS, and pregnancy rate. Forty-eight crossbred cows (Brahman x British) and their calves were stratified by parity and calving date and randomly allotted to treatment using a 2 x 2 factorial arrangement, which included early- and normal-weaned and multi- and primiparous cows (n = 12 / treatment). Cows were maintained on bahiagrass pastures for a period of 60 d (3 pastures / treatment; 4 cows / pasture) and provided free-choice access to grass hay and 2.3 kg daily of supplemental liquid molasses (16% CP). An estrus synchronization and timed-AI protocol was applied to all cows 21 d after early weaning (d 0). All cows were exposed to mature Angus bulls for 21 d after the conclusion of the study. Cow BW and BCS were collected at d -21 (date of early weaning), d 0, d 30, and d 60. Hay DMI was 12% less (P < 0.001) for early-weaned cows, irrespective of parity (6.8 vs. 7.7 kg/d for early- and normal-weaned cows respectively; SEM = 0.31). Throughout the study, multiparous cows were heavier (P < 0.01) with greater (P < 0.01) BCS compared to primiparous cows. On d 0, the BW of early- and normal-weaned cows did not differ; however, by d 60, early-weaned cows had gained more BW than normal-weaned cows, irrespective of parity

($P < 0.01$; 28 and 2 kg of gain for early- and normal-weaned cows, respectively; SEM = 2.5). Early weaned cows tended (P = 0.15) to have a greater overall pregnancy rate (82% vs. 63%) compared to normal-weaned cows (18 of 22 and 15 of 24 pregnant, respectively). There were no significant weaning x parity treatment interactions for pregnancy rate. These data imply that early-weaned cows, both multiparous and primiparous, have a greater increase in BW and BCS and consume less hay compared to normal-weaned cows.

Key Words: Weaning, Parity, Pregnancy

125 Assessing castration at arrival on long-term growth performance of cattle. M. D. Ratcliff*, E. B. Kegley, K. S. Lusby, S. A. Gunter, L. B. Daniels, and D. S. Hubbell, III, *University of Arkansas Division of Agriculture.*

Existing records were used to quantify the impact of castration upon arrival at a stocker unit on long-term growth performance and morbidity when compared to animals purchased as steers. Therefore, 923 male calves (BW = 181 ± 25 kg) received over three years were used to assess effects of castration on receiving health and ADG, as well as subsequent grazing performance. Data were compiled from eight studies conducted at the Livestock and Forestry Research Station in Batesville that had similar receiving protocols and grazing periods. All bull calves (n = 567) were castrated upon arrival, and their ADG and morbidity over the course of the receiving (range of 22 to 69 d) and grazing (range of 44 to 152 d) periods were compared to calves received as steers (n = 356). Bulls were either surgically castrated (3 studies) or castrated by banding (5 studies). Data were analyzed as a randomized complete block design with the MIXED procedures of SAS with experiment and the experiment by treatment interaction as random variables, and arrival sex (bull or steer) as the independent variable. During the receiving period, castrated bulls gained 0.11 kg/d less than steers ($P < 0.05$). Castrated bulls did not exhibit compensatory gain over the grazing period because there was no difference ($P = 0.40$) in grazing ADG between castrated bulls and steers. For the combined receiving and pasture periods, steers tended ($P = 0.09$) to gain faster (0.65 kg/d) than castrated bulls (0.60 kg/d). There were no differences ($P > 0.20$) between bulls and steers in morbidity or mortality rates, or number of antibiotic treatments required per calf. This study suggests that purchasing bulls over steers at lower costs would have a negative impact on receiving ADG and the overall ADG, but would not affect performance during the subsequent grazing period. Also, purchasing bulls versus steers did not affect morbidity or mortality rates, or number of required antibiotic treatments per calf.

Key Words: Cattle, Castration, Stocker Calves

126 Effects of time of castration on growth, feedlot performance, and carcass characteristics of Angus and Charolais-sired calves. M. L. Looper*[1], J. M. Burke[1], L. J. McBeth[2], C. R. Krehbiel[2], R. Flores[3], C. F. Rosenkrans, Jr.[3], and G. E. Aiken[4], [1]*USDA-ARS, Dale Bumpers Small Farms Research Center,* [2]*Oklahoma State University,* [3]*University of Arkansas,* [4]*USDA-ARS, Forage Animal Production Research Unit.*

Spring-born Angus and Charolais-sired calves (n = 54) were utilized to determine the effects of time of castration on growth, feedlot performance, and carcass characteristics. Calves were surgically castrated within 24 h of birth (CB; n = 25) or at weaning (CW; n = 29; mean age = 197 ± 2 d). After weaning, all steers were supplemented with 2.7 kg/d of a corn:soybean meal ration (CP = 12%) for 124 d, and then grazed Elbon rye (*Secale cereale*) for 112 d until transport to the feedlot. Steers were weighed at weaning, initiation and termination of grazing rye, and at 28-d intervals in the feedlot. Carcass characteristics collected included hot carcass weight, fat thickness (FT), longissimus muscle area (LMA), marbling score (MARB), yield grade (YG), and quality grade. Adjusted 205-d weaning weights were similar (P > 0.10) between CB and CW steers (266 ± 5 vs 273 ± 4 kg, respectively). Average daily gain during rye grazing was not different (P > 0.10) between castration treatments (0.86 ± 0.04 and 0.91 ± 0.04 for CB and CW steers, respectively). Final BW of steers grazing rye was 392 ± 7 kg for CB steers and 405 ± 6 kg for CW steers (P > 0.10). For the first 56 d of the feedlot phase, CW steers (3.0 ± 0.1 kg/d) gained more (P < 0.05) than CB steers (2.7 ± 0.1 kg/d). However, feedlot performance was similar (P > 0.10) between castration treatments during the entire feeding

period; ADG was 2.2 ± 0.1 and 2.3 ± 0.1 kg for CB and CW steers, respectively. Carcass characteristics were not influenced ($P > 0.10$) by castration treatment. Breed of sire affected ($P < 0.05$) carcass characteristics. Angus-sired steers had increased ($P < 0.05$) FT, MARB, and YG than Charolais-sired steers. Charolais-sired steers had a larger ($P < 0.05$) LMA than Angus-sired steers. Percentage of steers with Choice carcasses was similar ($P > 0.10$) between castration treatments. Angus-sired steers (54%) had more ($P < 0.05$) Choice carcasses than Charolais (21%). Castration at either birth or weaning did not alter growth, feedlot performance, or carcass characteristics of Angus and Charolais-sired steers.

Key Words: Beef Steers, Castration, Carcass Characteristics

127   The effects of energy supplementation and metaphylaxis on the performance of newly received cattle. S. A. Gunter*[1], P. A. Beck[1], and D. S. Hubbell, III[2], [1]*University of Arkansas, Southwest Research & Extension Center, Hope,* [2]*Livestock & Forestry Branch Station (LFBS), Batesville.*

Two groups (n = 130/each group) of crossbred bull and steer (BW = 210 ± 3.5 kg) calves were purchased and received at the LFBS in the winters of 2003 and 2004. Cattle were weighed and assigned to one the following treatments in a split-plot design (3 x 2 factorial arrangement; 2 pens/treatment/yr): 1) fed corn and cottonseed meal based supplements at 0.5, 1.0, or 1.5% of BW (main-plot) and 2) received either no metaphylaxis or a metaphylaxis by injecting 450 mg of tilmicosin phosphate/45.4 kg of BW (subplot). Making diets isonitrogenous, the supplements for 0.5, 1.0, and 1.5% of BW were 36, 18, and 12% CP, respectively. The cattle were processed by treating with ivermectin, vaccinating with a 7-way Clostridial and 4-way respiratory vaccine, bulls were castrated by banding, and horns tipped. Cattle were observed daily for sign of respiratory disease (**RD**), when calves were pulled and rectal temperature was #8805 $40°$C, calves were treated sequentially with 1) tilmicosin, 2) enrofloxacin, or 3) florfenicol. Cattle had ad libitum access to bermudagrass hay and were weighed on d 14 and 28. Body weight at receiving, d 14 (avg = 224 kg) and 28 (avg = 237 kg), ADG (avg = 0.95 kg), or total gain (avg = 28 kg) did not differ between metaphylaxis ($P > 0.13$) or supplementation rate ($P > 0.49$). No interaction ($P > 0.17$) between supplementation rate and metaphylaxis was detected. The percentage of cattle treated for RD one, two, or three times did not differ by supplementation rate ($P > 0.67$; once = 50, 49, or 47%; twice = 18, 21, or 21%; three = 7, 5, or 7%, respectively) or metaphylaxis ($P > 0.60$; once = 50 or 49%; twice = 21 or 18%; three = 6 or 6%, respectively). Feed a high-energy supplement to newly received cattle at greater then 0.5% of BW does not seem to increase ADG or the incidence of RD when calves have ad libitum access to hay; metaphylaxis did not reduce the incidence of RD or interact with supplementation rate.

Key Words: Metaphylaxis, Beef Cattle, Antibiotics

128   Effects of anthelmintic treatment on calf gains while grazing tall fescue. C. Rosenkrans, Jr.*[1], M. Nihsen[1], Z. Johnson[1], T. Yazwinski[1], D. Kreider[1], K. Coffey[1], W. Coblentz[1], and C. West[2], [1]*Department of Animal Science, University of Arkansas,* [2]*Department of Crop, Soil, and Environmental Sciences, University of Arkansas.*

Two trials were conducted to determine effects of ivermectin on calf gains while grazing toxic tall fescue. Trial one was a two-year grazing trial designed to determine if calf gender, anthelmintic, and forage cultivar interactively affected calf gains during summer grazing. Each pasture (1.62 ha) was allotted two steers and two heifers grazing from mid-June until mid-August. All animals in a given pasture received either ivermectin every 21 days or fenbendazole in their mineral daily for the duration of the trial. Tall fescue cultivars tested were K31+, HiMag , HiMag 4, and HiMag 9. Calves grazing endophyte-free (HiMag) and novel endophyte-infected (HiMag 4, HiMag 9) cultivars gained more ($P < 0.05$) weight than calves grazing toxic tall fescue (K31+). Both anthelmintic treatments resulted in virtually no internal parasites. Gain was affected ($P < 0.05$) by a three-way interaction between calf gender, forage cultivar, and anthelmintic treatment. The means separation indicated that steers grazing toxic fescue treated with ivermectin gained numerically faster than steers treated with fenbendazole; however, anthelmintic treatments resulted in similar gains for heifers. Trial two was a single year grazing trial to determine the effects of anthelmintic treatment and forage cultivar on steer gains. Six steers (BW = $314 \pm$

19 kg) were allotted to each pasture. Pastures (1.62 ha) were either K31+ (n = 3) or HiMag 4 (n = 2). All steers were given daily access to a mineral containing fenbendazole. Three steers within each pasture received ivermectin every 21 days and the other three steers received a double dose of fenbendazole every 21 days. Fecal egg counts were determined and no internal parasite eggs were detected. Steers grazing HiMag 4 had greater ($P < 0.05$) gain than steers grazing K31+; however, anthelmintic treatment did not alter steer gain. These grazing trials indicate that ivermectin does not consistently improve animal performance on toxic tall fescue.

Key Words: Tall Fescue, Cattle, Ivermectin

129   Optimizing N supply for growing steers consuming forage diets supplemented with citrus pulp. J. D. Arthington*[1,2] and A. T. Adesogan[1], [1]*University of Floria, Department of Animal Sciences,* [2]*University of Florida, Range Cattle Research and Education Center.*

Citrus pulp is typically high in energy (approximately 80% TDN), but low in CP (approximately 6% CP). The objectives of this study were to compare the effect of different sources of dietary N on growth, forage DMI, and diet utilization in growing steers provided citrus pulp supplements and ad libitum grass hay. Two studies were conducted. In Exp. 1, diet DMI and apparent diet digestibility was determined in four Braford steers randomly assigned to one of four sources of supplemental N, including, 1) urea (U), 2) roasted soybean meal (RSBM), 3) soybean meal (SBM), or 4) no supplemental N (CON). Supplements were formulated to provide equivalent amounts of CP (11.9%) and TDN (66%). Each treatment was randomly assigned to steers using a cross-over design containing four, 21-d periods. Periods were composed of 14 d of acclimation followed by 7 d of total fecal collection. Supplement and forage DMI was determined daily. Diet DMI (% BW) was least ($P < 0.05$) for CON compared to all other treatments (1.37, 2.02, 2.15, and 1.81 for CON, RSBM, SBM, and U, respectively; SEM = 0.10). Steers provided soybean meal treatments experienced greater ($P < 0.05$) apparent diet digestibility compared to CON, but not U-supplemented steers (60.5, 67.9, 66.7, and 63.7 % for CON, RSBM, SBM, and U, respectively; pooled SEM = 1.75). In Exp. 2, 24 individually-fed, crossbred steers were provided citrus pulp supplements fortified with SBM, U, or CON (8 steers/treatment) for 56 d. Steer BW gain and diet DMI was determined. Diet DMI was greatest ($P < 0.05$) for steers provided SBM, compared to U and CON (2.11, 2.52, and 2.17 % BW for CON, SBM, and U, respectively; SEM = 0.10). Steer BW gain was greatest ($P < 0.05$) for SBM, followed by U, which was greater ($P < 0.05$) than CON (0.12, 0.74, and 0.51 kg/d for CON, SBM, and U, respectively; SEM = 0.07). These data indicate that supplemental N is important for growing steers provided forage diets supplemented with citrus pulp. Natural protein sources, such as soybean meal, may improve performance and diet digestibility beyond that achieved by NPN sources, such as urea.

Key Words: Citrus Pulp, Protein, Forage

130   Cotton by-product supplements fed with hay: Steer performance and diet digestion. G. M. Hill*, J. F. Baker, B. C. Hand, and B. G. Mullinix, Jr., *University of Georgia.*

Beef steers weaned in September, 2003, were fed cottonseed meal (CSM) and whole cottonseed (WCS), with or without a molasses product (M; 65% DM, 37% total invert sugars) as a flavor enhancer, in supplements fed with hay in growth and digestion experiments. Exp.1. Beef steers (n=84) were assigned to six dietary treatments in a 2 X 3 factorial experiment for 85 days. Supplements (2.0 kg/steer daily) included: rolled corn with CSM (CCSM; 84.5% corn, 14% CSM); corn with WCS (CWCS; 40% corn, 60% WCS); CS (100% WCS), and three respective supplements with 4% M replacing corn or WCS. Minerals and bermudagrass hay (91.5% DM, 11.4% CP, 78.6% NDF) were fed free-choice to steers assigned to replicated bermudagrass pastures (12 pastures; 0.81ha). Using initial BW as a covariate, steers had higher ADG ($P < 0.01$; Table) when fed CCSM than CWCS or CS, and feeding M did not affect ADG. Hay DMI tended to be lower for steers on CWCS and CS diets. Exp 2. Six supplements described in Exp.1 were fed (2.0 kg/steer daily) with free-choice Tifton 85 hay (12.2% CP, 78.6% NDF). In the 19-day study, steers (n=36; 244.9 kg initial BW) were blocked by BW, and randomly assigned to supplement treatments (6 steers/treatment; individually-fed). Chromic oxide (10 g/steer daily; d 10 to d 19) was

fed as an indigestible marker to determine apparent digestion. Dietary DMI and apparent digestion of DM, ADF, and NDF were depressed ($P < 0.01$) for CWCS and CS supplements. Addition of WCS tended to increase CP digestibility, but an interaction ($P < 0.05$) occurred with supplements and M for CP digestion. Feeding WCS to growing steers depressed ADG and dietary digestibility.

Exp. 1	CCSM	CWCS	CS	SE	P	NoM	M	SE	P
Initial BW, kg	264.1	260.8	260.7	5.14	ns	263.5	260.3	4.20	ns
ADG, 85 d kg	0.56	0.39	0.30	0.06	0.05	0.43	0.41	0.05	ns
Hay DMI, kg	2.33	1.83	2.00	0.28	ns	1.95	2.15	0.23	ns
Exp. 2; DMI, kg	5.28	4.77	4.36	0.14	0.01	4.94	4.67	0.12	0.11
DM digestion, %	73.0	67.8	64.7	0.74	0.01	69.7	67.3	0.60	0.01
CP digestion, %	64.1	69.0	70.7	1.52	ns	69.6	66.3	1.24	ns
ADF digestion, %	66.4	59.4	57.9	1.50	0.01	62.9	59.6	1.22	0.07
NDF digestion, %	72.8	67.1	65.4	1.04	0.01	69.6	67.3	0.85	0.06

Key Words: Steer, Cottonseed, Gain

131   The effect of replacing soybean meal with _Mucuna pruriens_ on the performance of sheep. S. Chikagwa-Malunga*[1], A. Adesogan[1], M. Huisden[1], S. Kim[1], N. Krueger[1], D. Dean[1], T. Ososanya[1], K. Arriola[1], and S. Phatak[2], [1]_University of Florida,_ [2]_University of Georgia._

Mucuna pruriens (Velvet bean) seeds are rich in CP (25 -35 %), but they are largely unexploited as ruminant protein supplements. This study aimed to determine the effect of replacing soybean meal with _Mucuna_ on the performance of lambs. In the first of two experiments with completely randomized designs, feed intake and digestibility were determined in forty Rambouillet lambs ($31.6 + 6$ kg) fed a basal diet of corn, cottonseed hulls, molasses, and urea. Ten lambs were randomly assigned to one of four supplements formulated by substituting 0 (SBM), 33 (Lo), 67 (Med) or 100 (Hi) % of soybean meal with crushed _Mucuna_ seeds (M). The lambs were housed individually in metabolic crates and allowed ad. libitum access to the isocaloric (78 % TDN) and isonitrogenous (14.6 % CP) diets for 14 d of adaptation and 7 d of total fecal collection. In Experiment 2, the lambs were penned in groups by treatment, fed a basal diet of coastal bermudagrass hay, corn, urea and molasses and supplemented with SBM, Lo, Med or Hi M for 42 d and BW was measured every 21 d. The DMI of sheep fed SBM and Hi M was similar (P>0.05, 3.57 and 3.46 kg/hd/d, respectively) and greater (P<0.0001) than those of sheep fed Med M or Lo M (3.28 and 2.89 kg/hd/d, respectively). Apparent DMD was greater (P<0.05) in sheep fed Med M (91.6 %) than sheep fed SBM (90.1 %), but sheep fed Lo and Hi M had similar (P>0.05) DMD values (91.1 and 91.2 % respectively) to the other treatments. Lamb BW gain did not differ (P>0.05) among treatments (0.21, 0.17, 0.13 and 0.15 kg/d for SBM, Lo, Med and High M, respectively), though it was numerically lower in diets containing M. These results suggest that _Mucuna_ seeds are a promising protein supplement for ruminant livestock, particularly in situations or countries where soybean meal is unaffordable or unavailable.

Key Words: Mucuna, Digestibility, Intake

132   Effects of nitroethane administration on methane production in growing steers. E. G. Brown*[1], G. E. Carstens[1], L. J. Slay[1], S. A. Woods[1], M. J. Quinn[1], J. L. McReynolds[2], R. C. Anderson[2], and D. J. Nisbet[2], [1]_Texas Agricultural Experiment Station,_ [2]_USDA/ARS, Food and Feed Safety Research Unit._

Objectives of this study were to examine effects of level of nitroethane (NE) on methane (CH_4) emissions and ruminal CH_4 producing activity (RMA) in growing calves. Holstein steers were assigned to one of four treatments (n = 6): 0X, 1X, 2X and 4X NE with 1X = 1 g of 2-nitroethane/kg diet. The sodium salt of 2-nitroethane was administered via oral gavage in equal doses at 08:00 and 16:00 daily for eight d. The experimental diet consisted of alfalfa (40%) and bermuda grass (30%) hay, cottonseed hulls (11%), corn (11.5%), molasses (7%) and premix (.5%). CH_4 emissions were measured using the sulfur hexafluoride (SF_6) tracer gas technique on d -4, -2 and 0 prior to start of NE treatments to establish baseline CH_4 values, and on d 2, 4 and 8 of the study. Exhaled gases were collected for 16 h (16:00 to 8:00), and analyzed for SF_6 and CH_4 via gas chromatography. RMA was measured by vitro incubation of ruminal fluid collected on d -4, 2 and 8 of the study via stomach tube 2 h after 8:00 feeding. Initial and d-8 BW were not affected ($P > 0.1$) by treatment and averaged 319 ± 6.5 and 327 ± 7.2 kg, respectively. Average DMI during the 8-d period were 8.5, 8.8, 7.2, and 7.8 ± 0.5 kg/d for 0X, 1X, 2X, and 4X NE treatments, respectively. Baseline CH_4 emissions and RMA on d -4 were not affected ($P > 0.1$) by NE treatment and averaged 6.35 ± 0.4 % gross energy intake (GEI) and 3.01 ± 0.27 umol CH_4/mL rumen fluid. On d 2, steers administered 1X (5.8 ± 0.35 % GEI) and 4X (5.64 ± 0.54 % GEI) NE treatments had lower ($P < 0.02$) CH_4 emissions than control steers (7.4 ± 0.39 % GEI) with 2X steers (5.8 ± 0.35 % GEI) being intermediate. On d 4, 1X (4.94 ± 0.45 % GEI) and 4X (5.23 ± 0.69% GEI) NE treated steers had lower ($P < 0.05$) CH_4 emissions than control steers (7.09 ± 0.55 % GEI) with 2X steers (5.73 ± 0.45 % GEI) being intermediate. CH_4 emissions of 4X NE steers continued to be lower than control steers on d 8 (4.6 vs $6.36 \pm .69$ % GEI) with 1X and 2X NE being intermediate. RMA were lower ($P < 0.07$) for 2X and 4X NE steers than control and 1X steers on d 2, but not on d 8. Results demonstrate that NE reduced in vivo CH_4 emissions in calves for up to 8 d.

Key Words: Methane

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