

Production, Management and the Environment: Diet and Forage II

594 Effects of dietary fiber type and inclusion level on the physico-chemical composition of excreta of pigs. C. T. Mpendulo* and M. Chimonyo, *Animal and Poultry Science, College of Agriculture, Engineering and Science, University of Kwazulu-Natal, Pietermaritzburg, South Africa.*

The objective of the current study was to determine whether including varying fibrous ingredients of varying inclusion levels would change the physico-chemical composition of pig excreta. Dietary fiber inclusion to pig rations alters the physico-chemical components of pig excreta. Pigs weighted 20 and 40 kg, on average, at the start and end of the trial. Dietary fiber sources used were grass hay (GH), alfalfa hay (AH), corn cob (CC), corn stover (CS) and sunflower husk (SH). The fibers were included at 0, 80, 160, 240, 320 and 400 g/kg inclusion level. Each treatment had 4 pigs. The pigs were fed ad libitum, and were adapted to the diet for 10 d. Dietary fiber inclusion influenced nutrient removal patterns of both the feces and urine. Fecal nitrogen was lowest in pigs fed on CC and the AH containing diets (2.21 ± 0.082) and (2.11 ± 0.082) ($P < 0.01$). Neutral detergent fiber and acid detergent fiber contents were highest in pigs fed on rations containing GH and CS (1805 ± 25.8) and (1335 ± 25.8), respectively ($P < 0.01$). Pigs fed on high fiber content excreted more feces and produced less urine than those on the control diet ($P < 0.05$). It was concluded that as dietary fiber content was increased, fecal nitrogen increased, resulting into a shift of nitrogen from urine to feces.

Key Words: dietary fiber, pig excreta, pig

595 Effects of cinnamon extracts on urease activity and emission of NH₃ and H₂S of piglet slurry. A. Chen*, Y. Xiao, C. Li, Q. Hong, and C. Yang, *Zhejiang University, Hangzhou, Zhejiang, China.*

The emission of NH₃ and H₂S from the slurry in pig farm is a severe challenge to the habitat and inhabitant. This study was conducted to investigate the effects of cinnamon extract (CE) on urease activity, inhibition of bacteria related to urease production, and emission of NH₃ and H₂S in piglet slurry in vitro and in vivo. In Exp. 1, CE was dissolved in 95% ethanol at the following concentration: 0, 125, 250, 500, 1000, 2000 mg/L. Then they were respectively added to urease solution and the culture medium of *Escherichia coli*, *Proteus vulgaris* and *Staphylococcus aureus* to evaluate the inhibitory effect. In Exp. 2, CE was added to the mixture of urine and feces, the time-course of concentrations of urea nitrogen (UN), NH₃, and H₂S were analyzed from 6 h to 168 h. In Exp. 3, 144 piglets of 35 d were assigned to one of the 2 dietary treatments, representing supplementation with 0 or 350mg/kg CE to the basal diet. Feces and urine were collected from d 33 to 35, and blood samples were obtained on d 35. Results showed CE decreased the urease activity and inhibited the activity of *Escherichia coli*, *Proteus vulgaris* and *Staphylococcus aureus*. The concentration of UN in the mixture of urine and feces in CE-added treatment was higher ($P < 0.05$) than that in the control from 6 h to 168 h, but the concentration of H₂S was lower ($P < 0.05$). Compared with the control group, growth performance in CE group changed little ($P > 0.05$), whereas urease activity in feces decreased by 17.16% ($P < 0.05$). It was observed that the concentration of UN in the mixture of urine and feces in CE group was greater ($P < 0.05$) vs. the control, but the concentrations of NH₃ and H₂S were less ($P < 0.05$). Additionally, serum concentrations of UN and NH₃ decreased ($P < 0.05$) by 9.27% and 25.97%, respectively, by the CE treatment. These findings suggest that CE decreases urease

activity and inhibits the activity of bacteria related to urease production to increased the retention of NH₃ and H₂S in pig slurry. It is an effective botanical deodorant in pig industry.

Key Words: cinnamon extract, piglet slurry, urease activity

596 The effects of environment-friendly feed on growth performance and excrements of piglets. N. Zhang* and C. Jiang, *Feed Research Institute, Chinese Academy of Agricultural Sciences, Beijing, China.*

The nutrient composition of swine excreta can be altered by manipulating the composition of diets. Environment-friendly feeds, which are formulated according to the feed's digestible amino acids, the ideal protein approach, available phosphorus, the addition of phytase and the addition of plant extracts instead of antibiotics, aid to maintain growth performance and lower nitrogen and phosphorus excretion in piglets. This study determined the effects of an environment-friendly feed on growth performance and nutrient excretion of piglets. One hundred and eighty weaned piglets were divided into 2 groups with 6 replicates (15 piglets per replicates), and fed either a basal diet (control) or an environment-friendly diet. All animals were fed ad libitum with free access to water. The experiment lasted for 42 d. The animals were weighed at the beginning and the end of experiment, and group feed intake of each replicates was recorded. The nutrient digestibility was measured by the indirect method using Cr₂O₃ as a digesta marker. Compared with the control, the average daily gain of piglets fed the environment-friendly diet was increased by 7.6% (465.0 vs 500.2 g/d, respectively, $P < 0.05$), the ratio of feed to gain was decreased by 8.9% (2.13 vs 1.94, respectively, $P < 0.05$). The digestibility of DM, OM, CP and EE was improved numerically by the environment-friendly feed ($P > 0.05$). Compared with control, the daily excretion of fecal N, P, Cu and Zn in piglets receiving the environment-friendly feed were decreased by 10.6% (2.83 vs 2.53 g/d, respectively, $P < 0.05$), 55.6% (0.54 vs 0.30 g/d, respectively, $P < 0.05$), 84.3% (23.2 vs 3.64 mg/kg, respectively, $P < 0.05$), and 76.3% (22.0 vs 5.22 mg/kg, respectively, $P < 0.05$). The results suggested that the environment-friendly feed enhanced the growth performance of piglets and decreased the environment pollution by nutrients in swine production.

Key Words: piglets, environment-friendly feed, pollution of environment

597 Foliar uptake and utilization of phosphorus by grazing cattle as influenced by nitrogen fertilization regime. S. L. Dillard*, W. F. Owsley, C. W. Wood, B. H. Wood, C. J. Weissend, and R. B. Muntifering, *Auburn University, Auburn University, AL.*

Efficiency of nutrient utilization in grazed pasture may be increased by management practices that facilitate phytoextraction of nutrients from nutrient-enriched soils. A 2-yr experiment was conducted to determine the effect of N fertilization regime on foliar P uptake and utilization by cattle in pasture with high soil-test P. In October 2010 and 2011, 6 0.28-ha plots were overseeded with triticale (*Triticum secale*) and crimson clover (*Trifolium incarnatum*) into a tall fescue (*Lolium arundinacea*)/bermudagrass (*Cynodon dactylon*) sod and assigned to 1 of 3 treatments (trt) (n = 2): 100% of N recommendation for tall fescue in a split application, 50% of N recommendation and 0% of N recommendation. In January, 6 cattle were randomly assigned to graze plots

(1 animal/plot) until May. In June, plots were overseeded with cowpea (*Vigna unguiculata*) and maintained on the same N-fertilizer regimes, based on N recommendation for bermudagrass. In August, 6 steers were randomly assigned to graze plots until September. Forages were sampled biweekly, and intake and fecal excretion of P were determined twice in each season of both years using Cr dilution technique by reference to forage IVDMD. Data were analyzed as a completely randomized design using mixed-model procedures. Mean available DM mass was not different among trt or between yr, and was greater ($P < 0.05$) for cool-season (CS) than warm-season (WS) forage (3,628 vs. 2,612 kg DM/ha). Mean foliar P mass was not different among trt or between yr, but CS forage had greater ($P < 0.05$) available P than WS forage (8.0 vs. 6.2 kg P/ha). Intake of P by cattle was not different among trt or between seasons, but was greater ($P < 0.05$) in 2012 than 2011 (28.5 vs. 11.1 g P/d). Similarly, fecal P output was greater ($P < 0.05$) in 2012 than 2011 (22.0 vs. 12.6 g P/d) but was not different among trt or between seasons. Nitrogen-fertilization trt did not affect available forage DM or foliar P mass. Results are interpreted to mean that grazing season had a greater effect than N fertilization on foliar P dynamics, whereas year had the greater effect on P utilization by cattle.

Key Words: phosphorus, cattle, nitrogen

598 Forage allowance on reproductive response of primiparous cows submitted to suckling restriction and flushing grazing Campos native pastures. M. Claramunt¹, M. Carriquiry², G. Gil¹, and P. Soca^{*3}, ¹Facultad de Veterinaria, Universidad de la Republica, Paysandu, Uruguay, ²Facultad de Agronomia, Universidad de la Republica, Montevideo, Uruguay, ³Facultad de Agronomia, Paysandu, Uruguay.

Suckling restriction and flushing with energy supplement (S+F) is a tactical tool which enhances pregnancy in primiparous cows. Evaluation of any practice at grazing would be performed under 2 or more grazing intensities. The objective was to evaluate the effect of Forage allowance (FA) on BCS, probability of pregnancy and Calving conception interval (CI) of primiparous cows with S+F grazing Campos native pastures. The study took place in Facultad de Agronomia, Uruguay (31°S 57°W). Eighty spring calving primiparous cows were assigned in the previous autumn to a complete randomized experiment of 2 FA in spatial replication on 2 blocks during 2 years. The experiment started at autumn -150 d postpartum (dpp) and finished 190 dpp. Treatments consisted in annual average FA of 10 and 6 kg DM/100kg liveweight (LW)/d for high (H) and low (L) respectively. Grazing system was continuous. The LW and FM were determined monthly and used to adjust FA by "put and take" method. At 82 ± 12 dpp cows were exposed to bulls for 80 d. Calf suckling restriction with nose plate during 12 d and flushing offering 2 kg/cow d of whole rice middling were applied at 76 ± 12 dpp. Pregnancy diagnoses for early (EP) and total (TP) probability of pregnancy were performed 152 and 205 ± 12 dpp. Date of subsequent calving was recorded and CI was determined. The experimental unit was the group of cows grazing a plot. Effect of FA on EP, TP and CI

were analyzed by generalized linear model with logit function and binomial distribution and effect of FA and FA*dpp on BCS by repeated measurements. FA increased BCS during prepartum but not at calving and after ($P = 0.03$). FA did not affect EP (0.6 ± 0.09 $P = 0.3$) but TP was superior in H than L cows ($P = 0.07$ 0.9 vs 0.6 ± 0.04). The CI was reduced 12 d in H ($P < 0.05$). Increase FA improved reproductive performance of primiparous cows. The lacks of differences in BCS at calving and postpartum reflect a long-term effect of FA on cow energy balance to improve reproduction.

Key Words: forage allowance, flushing, suckling restriction

599 Utilization of stockpiled perennial forages in winter feeding systems for beef cattle. D. G. R. S. Kulathunga^{*1}, H. A. Lardner^{1,2}, J. J. Schoenau¹, and G. B. Penner¹, ¹University of Saskatchewan, Saskatoon, SK, Canada, ²Western Beef Development Centre, Humboldt, SK, Canada.

A study was conducted to determine the effects of grazing stockpiled forage as an extensive winter feeding system relative to feeding a similar quality baled hay in a dry lot setting on beef cow performance, reproductive efficiency, dry matter intake, forage utilization, forage yield and quality, and system costs. Winter feeding systems were (1) field grazing stockpiled perennial forage (SPF) consisting of a meadow bromegrass (*B. riparius*)-alfalfa (*M. sativa*) blend (TDN = 52.5%; CP = 11.2%) with (2) dry lot (DL) cows receiving a similar quality hay (TDN = 54.6%; CP = 10.2%). Sixty dry pregnant Angus cows (675 kg ± 51 kg), stratified by body weight (BW; corrected for conceptus gain), were allocated to either the SPF or DL systems (n = 3). Drylot and SPF cows were supplemented with rolled barley (TDN = 86.4%; CP = 12.4%) at 0.05 and 0.4% of BW, respectively. Cow body condition score (BCS), rib and rump fat were measured at start and end of study and BW was measured every 14 d during the trial. Dry matter intake (DMI) was estimated using the herbage weight disappearance method. Statistical analysis was conducted as a one way ANOVA using the Proc Mixed Model procedure of SAS. Forage yield before grazing was not different ($P = 0.52$) between DL and SPF systems (4413 ± 914 vs. 4130 ± 673 kg/ha, respectively) however, forage utilization was higher ($P = 0.001$) in DL (94.3%) than SPF (68.1%) system. Total DMI between DL and SPF systems was not different ($P = 0.29$), 10.4 vs. 11.2 kg/d, respectively. For DL and SPF systems, cow BW change (18.2 vs. 17.5 kg; $P = 0.89$), average daily gain (0.34 vs. 0.33 kg/d; $P = 0.96$), rib fat change (2.6 vs. 3.1 mm; $P = 0.34$) and rump fat change (2.6 vs. 2.7 mm; $P = 0.76$) were not different. Calf birth weight (42 ± 14 vs. 41 ± 18 kg; $P = 0.37$) and calving interval (363 ± 9 vs. 361 ± 2 d; $P = 0.72$) did not differ between DL and SPF systems, respectively. Total costs were \$1.71 and \$1.55 cow/day for DL and SPF systems, respectively. These study results suggest it may be cost effective to manage beef cows in field, grazing stockpiled forage and that winter feeding system does not affect cow performance.

Key Words: stockpiled forage, beef cow