Effects of level of broiler litter in diets containing wheat straw on performance of Alpine doelings


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Residues from cereal grain production are important feedstuffs for ruminants throughout the world. They are, however, low in protein and high in fiber, which limit feed intake and digestibility. The nutritive value of cereal crop residues can be improved by various processing methods, such as treatment with alkalis like sodium hydroxide or ammonia. Another means of improving nutritive value of cereal crop residues is supplementation with other feedstuffs, particularly ones high in crude protein. Broiler litter is a low-cost agricultural byproduct available in many areas of the world. The crude protein concentration in broiler litter is usually between 15 and 35% of dry matter, and the available energy concentration in broiler litter is moderate. Thus, objectives of this experiment were to compare feed intake, average daily gain, and gain efficiency of growing Alpine doelings consuming diets based on wheat straw supplemented with different levels of broiler litter to wheat straw supplemented with a conventional protein source or ammoniated through urea treatment. Treatments were feeding of a corn-based concentrate at 1.5% of body weight (dry matter basis) with treated wheat straw and this supplement plus approximately 0.4% body weight of soybean meal or 0.8 or 1.6% body weight of broiler litter with untreated wheat straw. Soybean meal supplementation of wheat straw supported average daily gain as great as urea-treated wheat straw, and with less total feed consumption. Dietary inclusion of broiler litter also resulted in gain similar to that with urea treatment of wheat straw and soybean meal supplementation of untreated straw, but with greater feed input particularly for the highest level of litter. Hence, availabilities and costs of urea for ammoniation and crude protein supplements such as soybean meal and broiler litter, along with practical considerations including labor and facilities, would dictate the choice between urea treatment of low quality forages such as wheat straw and different supplemental sources of crude protein.

Performance effects of preweaning concentrate supplementation of meat goats

A. L. Goetsch, G. Detweiler, and T. Sahlu


The market weight for meat goats in the US is quite variable; however, sale weights near those typical of weaning time are common, possibly relating to the amount of disposable family income and yield of a quantity of meat suitable for consumption in a convenient period of time such as 1 or 2 weeks. Also, some consumers may prefer meat from young animals. Thus, means of enhancing growth of meat goat kids preweaning and in the early postweaning period is of interest to increase income for meat goat producers. In this experiment, Spanish does with Boer × Spanish or Spanish kids were used to determine effects of preweaning feeding of concentrate-based supplement on preweaning and early postweaning growth. In mid-April, from approximately 6 to 14 weeks after
birth, animals grazed wheat forage (Phase 1), followed by 5 weeks on native grass pasture (Phase 2) and an 8-week postweaning period with a moderate level of supplemental concentrate (Phase 3). Forage availability was moderate to high throughout the experiment. Treatments were no supplementation in Phases 1 and 2 (C), ad libitum consumption of a concentrate-based supplement in Phases 1 and 2 (A), no supplementation in Phase 1 and ad libitum consumption of supplement in Phase 2 (A-2), and limit feeding of supplement (approximately 1% of body weight, dry matter basis) in Phases 1 and 2 (L). Results indicated that with ample availability of forage of at least moderate quality as in Phase 1, suckling meat goat kids may not quickly achieve high levels of consumption of concentrate-based supplement. In accordance, preweaning supplementation did not enhance preweaning growth while grazing wheat forage or later when on warm-season grass pasture, regardless of growth potential as influenced by Spanish and Boer sires. However, preweaning supplementation generally did improve growth in the early postweaning phase with a greater level of supplementation than previously. Nonetheless, preweaning supplementation did not impact overall gain in the entire experiment.

Effects of different feeding methods on growth and harvest traits of young Alpine kids

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Compared with beef, lamb, and pork, chevon, particularly from young dairy kids, is quite lean, with little subcutaneous or intramuscular fat. Prior to the introduction of Boer goats, male kids from dairy goats harvested at a very young age provided much of the goat meat consumed in the U.S. In addition to feeding for early age slaughter, effective and economical feeding systems for dairy kids are needed for development of replacement doelings and with slaughter for meat at heavier weights and greater ages. Therefore, objectives of this experiment were to compare effects of ad libitum milk intake and limited milk consumption, with or without supplemental concentrate, on growth and carcass traits of Alpine kids at two harvest ages (10 and 13 weeks). Thirty wether kids (2 weeks of age) were given ad libitum (A) or limited (1 kg/day) access to milk, with (LC) or without (L) ad libitum supplemental concentrate. Average daily gain was lowest among dietary treatments for L and similar between A and LC at 10 weeks but greater for LC at 13 weeks (151, 55, and 149 g at 10 weeks and 110, 49, and 144 g at 13 weeks for A, L, and LC, respectively). Similar differences were observed in carcass weight (7.0, 3.7, and 6.1 kg at 10 weeks, and 6.8, 4.4, and 7.9 kg at 13 weeks for A, L, and LC, respectively). The ratio of kidney and pelvic fat to bone-free muscle was lowest among dietary treatments for L, similar between A and LC at 10 wk, and lower for LC versus A at 13 weeks (2.1, 0.5, and 2.0 at 10 wk and 2.7, 0.5, and 1.8 at 13 wk for A, L and LC, respectively). In summary, up to 10 weeks of age, either ad libitum consumption of milk or restricted milk intake with supplemental concentrate can be used to raise Alpine kids. However, with slaughter at ages greater than 10 weeks, body weight and carcass weight may be greater when concentrate is supplemented compared with ad libitum milk intake alone. Likewise, internal fat deposition can be elevated with extended ad libitum milk intake without supplemental concentrate.
Effects of small peptides or amino acids infused to a perfused area of the skin of Angora goats on mohair growth


Until recently, it was commonly believed that gastrointestinal digestion of proteins is complete and that only free amino acids enter circulation. However, a considerable body of evidence for absorption of peptides from the digestive tract has accumulated. Also, there are some reports suggesting effects of small peptides on fiber growth. Therefore, an experiment was conducted to compare effects of infusing a defined area of skin of Angora goats with small quantities of a mixture of dipeptides (methionine-leucine and lysine-leucine) or free amino acids on mohair fiber growth. Supplying small peptides or their amino acids directly to the skin equally increased mohair production compared with a control saline solution. Similar blood concentrations of various hormones and metabolites suggest that small peptides were utilized by skin for mohair fiber growth via supplying limiting free amino acids directly to the fiber follicle for protein synthesis.

Effects of prolactin administered to a perfused area of the skin of Angora goats


Decreased fiber growth by some breeds of sheep and Angora goats in early lactation has been attributed to a regulatory role of prolactin on increased nutrient use by the mammary gland. In addition to indirect influence, direct effects of prolactin on follicles are possible. Therefore, effects of infusing prolactin on mohair growth were investigated use a skin perfusion technique. Prolactin decreased mohair fiber growth in a perfused area of skin of Angora goats, implying a direct effect on skin metabolism and fiber growth. The decrease in mohair fiber growth was accompanied by a decrease in mohair staple length, indicating that all or a substantial portion of change in fiber growth was because of actions on active follicles rather than an increased number of inactive follicles. Decreased amino acid use by follicles of Angora goats when prolactin is elevated, such as in late pregnancy and early lactation, may contribute to partitioning of nutrients to other tissues.
Goat husbandry: feeding management

J. E. Huston and S. P. Hart


Goats are ruminant animals with an inquisitive and enterprising grazing-browsing behavior. Three general types include dairy, Angora (mohair), and meat goats. Nutrient requirements for goats are determined as the sum of the requirements for different physiological processes that are carried out simultaneously (e.g., maintenance, pregnancy, and lactation). The lactating dairy goat is the most productive and requires the highest levels of nutrients. The Angora is the most sensitive to dietary and environmental changes. Nutrient requirements and an example ration are presented in this review and discussed. Certain periods of the annual cycle are critical, especially for the Angora, and require special managerial attention. Many other management considerations either involving nutrition or having nutritional implications are very important in goat production. Among these are facilities, feed and water sanitation, parasitism, protection from adverse climate, predation, diseases, product quality, and marketing.

Effects of separate offering of forage and concentrate on feed intake and growth of Alpine doelings

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Of all classes of animals on dairy farms, growing replacements often receive the least attention, which is of concern given the considerable expense in rearing without milk output. Simple and effective feeding management practices for replacement dairy goat doelings after weaning have not been extensively explored. Therefore, 44 weaned Alpine doelings (16 ± 0.19 kg initial BW) were used in a 16-wk experiment to determine how separate free-choice offering of concentrate and forage (wheat hay, 14.2% CP and 62% NDF) affects performance compared with consumption of mixed diets of different proportions of concentrate and forage. An increasing level of concentrate (i.e., 25, 50 and 75%) in diets with moderate to high quality forage increased ADG by young Alpine doelings though did not influence feed intake. Separate and limited offering of concentrate (approximately 2% BW) resulted in performance as expected based on the resultant dietary concentrate level and responses to mixed diets. Overall ADG and ADG:DM intake in the 112-day experiment were slightly greater for doelings given separate free access to concentrate and forage than for doelings consuming a 75% concentrate mixed diet, even though dietary concentrate levels were similar, suggesting potential use of separate feeding for decreased feed mixing and labor inputs without sacrifice of animal performance.
Effects of diet quality and age of meat goat wethers on early subsequent growth while grazing wheat forage


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Annual wheat is a major source of nutrients for many ruminants in the south-central US, including a significant number of meat goats. However, performance of cattle and sheep in the first few weeks of wheat grazing is lower than expected based on concentrations of chemical constituents such as crude protein and neutral detergent fiber. Responsible factors have not been identified, although possible ones include digestive upset associated with an abrupt transition to highly digestible forage, low herbage mass and time required for adaptation by the ruminal microflora or tissues or organs, such as the digestive tract and liver, and tissues sensing the taste and texture of wheat forage. Therefore, 36 meat goat wethers (3/4 Spanish and 1/4 Boer), born in the previous Spring (initial age and BW of 8.5 months and 17 ± 0.6 kg) or Fall (initial age of 2.5 months and 13 ± 0.8 kg), were used to determine effects of ad libitum consumption of different quality diets and age on early subsequent growth while grazing wheat forage. The experiment was 14 wk long, with 9 wk in the winter consuming prairie hay (5% CP and 71% NDF) supplemented with 0.125% BW of soybean meal (PH), alfalfa pellets (AP), or a 70% concentrate diet (CD), and 5 wk in the spring grazing wheat forage. An obvious period of adaptation to grazing of wheat forage after consuming ad libitum different diets on pasture in the winter was not apparent with 3/4 Spanish wethers less than 1 year of age. The nature of diets consumed ad libitum did not impact subsequent growth, regardless of age, when grazing wheat forage. Overall ADG was greater in Period 2 when grazing wheat forage than earlier in Period 1, which contributed to greater differences in body composition, notably fat concentration, between wethers at approximately 5.5 vs 11.5 months of age than earlier at 4 vs 10 months.

Effects of different quality diets consumed continuously or after a lower quality diet on characteristics of growth of young Spanish goats


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There are several feeding options available to goat producers with fall-born kids. One for kids weaned in the winter is to graze or be fed harvested low-quality forage, such as prairie grass or prairie hay, which is usually abundant in winters. For many producers, this might be followed by consumption of relatively high quality forage or browse in the spring or, for others, there could be immediate or delayed placement on high grain diets. Therefore, the objective of this study was to elucidate effects of consuming different quality diets continuously or with an increase in diet quality during the latter part of the growing period on characteristics of growth by fall-born Spanish kids. The experiment consisted of two 9-wk periods. Diets were low quality forage (L; prairie hay
supplemented with soybean meal), high quality forage (H; dehydrated alfalfa pellets), and 70% concentrate (C). Kids on two treatments consumed L in Period 1, with half switched to C and half to H in Period 2 (LC and LH, respectively). The CC treatment entailed C consumption in both periods, and HH kids were fed H in both periods. For HC, H was fed in Period 1 followed by C in Period 2. Results indicated that diets high in concentrate may yield ADG similar to that for high quality forage but with greater fat deposition in both carcass and noncarcass components. Switching from a high quality forage to a concentrate-based diet resulted in ADG similar to that with continuous intake of both diets, but with increased fat and decreased protein deposition compared with continuous intake of high quality forage. Little or no BW change for kids consuming low quality forage, with fat mobilization to accrete a small amount of protein, resulted in smaller differences in subsequent fat and protein accretion when changed to high quality forage or a concentrate-based diet compared with continuous intake of high quality forage or a concentrate-based diet. In conclusion, the nature of the diet consumed by young Spanish goats can impact rate and characteristics of tissue accretion.

Relationships between body composition and shrunk body weight and urea space in growing goats


In order to accurately estimate nutrient requirements of livestock, it is desirable to know the composition of tissue accreted or lost. Much less information on body composition of goats is available relative to that for other ruminant species such as cattle and sheep. The cost and labor associated with harvest and the determination of chemical composition of the whole body or carcass and noncarcass components are high. Furthermore, such measures are terminal, necessitating assumptions of similar composition of other animals at later times in serial slaughter experiments. Therefore, there is need for simple, inexpensive and non-terminal means of assessing body composition of goats. In this regard, growing Spanish wethers and doelings (31; initial age of 3.5 mo) consumed ad libitum diets differing in quality continuously for 18 wk or with an increase in quality after 9 wk. Urea space (US), shrunk body weight (SBW) and chemical composition of the whole body were determined at the beginning, middle and end of the experiment. In addition, at the beginning of the experiment the same determinations were made with two yearling Boer × Spanish doelings that had consumed a high quality diet ad libitum for 12 wk. SBW accounted for most variation in body composition of growing goats of this experiment. Nonetheless, small improvements in explained variability resulted from inclusion of US in equations for water and fat. Equations yielding best prediction of body composition of weaned goats were: water (kg) = 1.274 + (0.1546 × US, kg) + (0.5782 × SBW, kg) - (0.0043 × SBW², kg); fat (kg) = -0.921 - (0.1520 × US, kg) + (0.1564 × SBW, kg) + (0.0064 × SBW², kg); protein (% water) = 34.696 - (0.1175 × predicted water, %); and ash (% water) = 0.0448 × predicted water, %. However, utility of such equations at present may primarily be for within experiment treatment comparisons or for assessing changes in composition.
Effects of melatonin and bromocryptine administration for Spanish goats on spring breeding performance, kidding rate and fleece weight


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The demand for meat goats in the USA increasing particularly in Christmas - Easter holiday seasons. Manipulation for spring breeding in goats could accelerate productivity of goat flocks, enhance profitability of producers, and increase the supply of meat goats value in high demand. In this regard, four Spanish bucks were conditioned for 2 months to long-day photoperiod (16-hour light: 8-hour dark), followed by a single melatonin implant (18 mg, 6-week release period). Eighty Spanish does were allotted to five treatments: control (C); melatonin implant (MI); melatonin and bromocryptine (225 mg, 60-day release period) implants (MIB); oral administration of melatonin (MO, 3 mg/day); and oral administration of melatonin and bromocryptine implant (MOB). After the fifth week of melatonin administration, does were randomized and bred in three single-sire groups for two estrus cycles. The artificial long day light conditioning and melatonin supplementation for bucks stimulated breeding behavior, libido, buck effect, and fertility during spring mating. Melatonin treatment and the buck effect induced out of season breeding in anoestrus does. Although there were not a large number of variables with significant treatment effects, these results suggest that melatonin implanted or orally administered daily would be necessary to achieve a high percentage of does bred and a large number of fall born kids. Furthermore, these findings imply that an accelerated out of season breeding system with goats, scheduling kidding twice both in the fall and spring is feasible. Such a system should increase total annual meat goat production as well as increasing meat goats available during the Christmas-Easter holiday season when prices are generally elevated. However, for rapid growth of fall born kids, it may be necessary to utilize high quality forages productive in the fall-winter period, such as cool season annuals. Out of season breeding also offer potential to decrease age of first breeding and concomitantly improve lifetime reproductive efficiency.

Effects of melatonin and bromocryptine administration for Spanish goats on seasonal cashmere growth, yield and fiber characteristics


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Manipulation for spring breeding in Spanish goats could improve reproductive efficiency, kidding rate, and cashmere production. Therefore, 80 Spanish does were used to determine effect of melatonin treatment on cashmere fiber growth rate, length, and characteristics during spring breeding. Treatments control (C); melatonin implant (18 mg; Regulin, Schering Pty. Ltd., Australia) without (MI) and with bromocryptine (225 mg) implants (MIB) (Innovative Research of America, Sarasota, FL); and oral administration of melatonin (3 mg/day) (Sigma Chemical Co., St. Louis, MO) without (MO) or with bromocryptine (MOB). Results of this experiment suggest that melatonin administration for spring breeding is an effective means of increasing cashmere production from
Spanish goats. Melatonin, given by oral or a slow release implant, increased fiber growth rate, fiber elongation, fiber diameter, and cashmere yield in spring months. These changes were accompanied by a delay in the initiation of fall growth, but this did not influence annual fleece weight. Manipulation of seasonal breeding in cashmere growing goats, such as Spanish, in the USA could both increase production of goat meat and extend the cashmere growth phase in spring.

**Effects of ruminally degraded nitrogen source and level in a high concentrate diet on site of digestion in yearling Boer × Spanish wether goats**


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The quantity and quality of protein reaching the small intestine are influenced by ruminally undegraded intake N or protein and microbial protein synthesized in the rumen. There have been few determinations of microbial protein synthesis in goats. Similarly, ruminal degradability of feed CP in goats has not been extensively studied, with some estimates based on in situ disappearance and assumed or measured ruminal digesta passage rate. Although differences between goats and other ruminant species in ruminal digesta passage rates are not well agreed upon, potential for differences with some diets raises the possibility that extent of ruminal digestion of protein differs between goats and cattle or sheep. Results of this experiment support suggestions that goats have considerable ability to recycle N to the rumen. For goats with ample tissue protein stores available for mobilization, this permits high microbial protein production and efficiency of microbial growth with high concentrate diets containing as little as 9.3–9.6% CP and with a ruminally degraded intake protein(DIP) to TDN ratio of 0.073. In such instances, only small increases in ruminal and total tract OM and NDF digestibilities can be achieved by supplying additional DIP, such as with a dietary CP concentration of 11.5-13.5% and a DIP to TDN ratio of 0.104-0.113. When ruminal ammonia availability is not limiting, with a high quality, high concentrate diet, it is unlikely that benefits in microbial growth or digestion will occur with use of a true protein source compared with a source of non-protein N such as urea.

**Tannins for suppression of internal parasites**

*B.R. Min and S.P. Hart*


This article is a review of published research that has been done with tannins on their possible use for controlling gastrointestinal parasites (worms), especially in goats. Gastrointestinal parasites in goats are developing resistance to dewormers and in the near future, dewormers will lose their effectiveness in controlling worms. Some laboratory studies have shown that tannins in plants may be effective in controlling worms and a few field studies have shown good results. Sericea lespedeza and oak species are examples of plants containing tannins. There are two mechanisms by which tannins may help to control worms. They may have an indirect mechanism in that they improve protein nutrition of the animal which helps the animal’s immune response. Protein nutrition is
improved by the tannin binding the protein in the rumen, preventing its degradation by rumen microorganisms, and stomach acids cause the tannins release the protein for digestion. This has been shown to improve protein supply of the animal by 20-40%. Tannins may also have direct effects on the parasites themselves. In some cases, egg production by the worms is reduced by more than 40%, causing a reduction in pasture contamination. One study showed that one type of worm is killed by tannins, but this species is not our most common worm in the South. Also, there is some evidence that tannins reduce hatch and development of worm eggs in the feces. From this review, it appears that research should be done on the use of tannins to control worms in goats.

The effect os short-term consumption of a forage containing condensed tannins on gastrointestinal nematode parasite infections in grazing wether goats

B. R. Min, W. E. Pomroy, S. P. Hart, and T. Sahlu


Some laboratory and small scale research has indicated that plants containing tannins may reduce hatching and development of internal parasite eggs. Tannins appeared to kill one species of worm in sheep. The present investigation was a short, preliminary study of the effect of sericea lespedeza, a common forage plant in Oklahoma which contains tannin, on internal parasites in goats. Wether goats with fecal egg counts greater than 1200 eggs/gram (wormy animals) were used in this study. Fecal egg counts were taken at the beginning of the study and at 5, 10, and 15 days of each period. One group of six wethers grazed crabgrass/ryegrass and one group grazed sericea lespedeza (height maintained at 7-9 inches). After 15 days (first period) the groups were switched to the other forage and data collected again. The major species of worm was the barber pole worm (*Haemonchus contortus*). During both periods, fecal egg counts on lespedeza started to decreased in only 5 days and by 10 and 15 days were significantly lower than for wethers grazing the sericea lespedeza pasture. Fecal egg counts increased in both periods for animals grazing the crabgrass/ryegrass. Fecal egg counts averaged 2,500 per gram for the crabgrass/ryegrass pasture and 700 eggs/gram for sericea lespedeza. Total daily production of fecal eggs was reduced from 1,730,000 to 450,000 eggs/day (a 74% reduction) by sericea lespedeza. In addition, the percentage of eggs in feces developing to L-3 infective larvae decreased from 99 to 58%. Sericea lespedeza helped to reduce pasture contamination by eggs and larvae and has great potential to help control internal parasites of goats.

Effect of feeding treatments and lactation stages on composition and organoleptic quality of goat milk Domiati cheese


To investigate the effect of pasture feeding with different levels of concentrate on the milk composition and quality of Domiati cheese, 20 lactating Alpine goats were randomly allocated to four groups. Group A was confined and fed alfalfa hay with 0.66 kg/d of concentrate mixture per 1.5 kg of milk (conventional confinement system with feeding). Groups B, C, and D were
rotationally grazed and received 0.66, 0.33, and 0 kg/d of concentrate, respectively. Milk from each group was processed into Domiati cheese twice monthly for a 6-month lactation period. Cheeses were sampled fresh and at 1 and 2 months of pickling in whey. Results of the present study indicate that feeding system of dairy goats with different levels of concentrate supplementation did not affect the composition (fat, protein, and total solids) of Domiati Cheese. Pasture-grazing without concentrate supplementation (Group D) resulted in a lower short-chain fatty acids content and a higher flavor score of Domiati cheese than the confined feeding system (Group A). Cheese age during pickling did not change flavor score but increased the total sensory score due to a smoother, creamier body and texture of cheese. As lactation advanced, contents of total, short- and long-chain fatty acids and the sensory scores of the cheese fluctuated markedly. Further research is needed to investigate the effect of fatty acids in diets on the profile of fatty acids in goat milk and cheese, and to correlate the individual fatty acids in diet, milk and cheese to establish the sensory quality of goat cheese.

Fatty acid profiles of goat milk and Domiati cheese as affected by pasture feeding and stage of lactation

K. A. Soryal, S. S. Zeng, B. R. Min, S. P. Hart, and K. Tesfai


Twenty lactating Alpine goats were randomly allocated to four groups to investigate the effect of feeding regimes with concentrate on fatty acid profiles of goat milk and Domiati cheese at different stages of lactation. Pooled milk from each group was collected twice monthly for Domiati cheese making. Cheese was sampled fresh and at 1 and 2 months of pickling in whey. Caproic, caprilic, and capric acids in goat milk were recorded at 1.9, 5.5, and 25.1 µg/g of fat, respectively, and accounted for 13.3% of total fatty acids. Total unsaturated fatty acids represented 28.9% of total fatty acids. In Domiati cheese, caproic, caprilic, and capric acids were 4.2, 7.4, and 31.4µg/g of fat, respectively, and accounted for 11.2% of total fatty acids. Total unsaturated fatty acids represented 26.8% of total fatty acids. Fatty acid composition of both milk and cheese was affected by feeding treatments and stages of lactation. All fatty acids of milk and cheese were lower when goats were pasture-fed compared with other groups except linolenic and stearic acids in goat milk and linolenic acid in cheese. Concentrations of caproic, caprilic, capric, palmitic, myristic, and oleic acids fluctuated throughout lactation with the highest values at mid-lactation. The above observations indicate that pasture feeding during mid-lactation could result in improved quality and nutritionally healthy goat milk and cheeses.