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Preference of grazing goats for cool-season annual clovers

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Abstract

Information on improved forages for goat grazing is lacking for the southern USA. Two cafeteria-style grazing trials were completed to determine preference of meat-type goats for cool-season annual clovers in Georgia. In both experiments, 8 replicates of 6 plots of clover cultivars were established, individually fenced, and grazed by Spanish goats for 48 hours during two grazing periods. Forage preference was determined by weighing strips of forage cut from plots pre- and post-grazing (Experiment 1) and by ocular scoring (1 = no grazing to 10 = completely grazed) after 4, 24 and 48 hours grazing (Experiment 2). In Experiment 1, 'Dixie' and 'AU Robin' crimson clover (*Trifolium incarnatum* L.) were most preferred, 'AU Sunrise' crimson clover and 'Yuchi' arrowleaf clover (*Trifolium vesiculosum* Savi) were intermediate, and 'Segrest' ball clover (*Trifolium nigrescens* Viv.) and 'R18' rose clover (*Trifolium hirtum* All.) were least preferred. Forage preference was not influenced by dry matter yield, fibre 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' 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 southern USA.

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Introduction

Production of goats is increasing in the southern USA because of high ethnic demand for goat meat and milk products and the relatively low cost of breeding stock. Although goats are considered predominantly browsers under range conditions, they can be productive when grazing high-quality forages (Stevens *et al*., 1993). Annual clovers provide high-quality winter and spring grazing for beef cattle and sheep in the South. New Zealand data on white clover (*Trifolium repens* L.) suggests that goats do not relish this plant as much as sheep (Clark *et al*., 1982), but little data are available on goat's willingness to consume different clover types in the USA. The objective of these experiments was to determine the grazing preferences of goats for annual clovers.

Materials and Methods

Two cafeteria-style grazing experiments were completed at the Fort Valley State University Agricultural Research Station, Fort Valley, GA., USA, from fall, 1999, through spring, 2001. For both experiments, 10 replicates of 6 clover cultivars were planted into 3.05 m x 3.05 m plots (November 10, 1999, and November 11, 2000 for Experiments 1 and 2, respectively) using a cone-type plot planter. Clover types studied in Experiment 1 included Dixie, AU Robin, and AU Sunrise crimson clover, Yuchi arrowleaf clover, Segrest ball clover, and R18 rose clover, while Dixie and AU Sunrise crimson, Yuchi arrowleaf with and without Apron fungicide coating, BYMV arrowleaf and R18 rose clover were tested in Experiment 2. Plots of Americus hairy vetch were also added for Experiment 2. For both tests, each block of plots was individually fenced, weeds were removed by hand, and rubber water pans were added prior to grazing. For two periods in each year (March 22-24 and April 12-14, 2000; March 26-28 and May 14-16, 2001), 32 Spanish does (3-4 yr old, Experiment 1) or 40 yearling Spanish-Boer cross castrated male kids (Experiment 2) grazed the plots for 48 hours. Before starting the trials, the goats were allowed to graze the first two blocks of forage plots as a single group for 48 hours to familiarize them with the forages and allow preferences to be established. After the adjustment period, the does or kids were

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stratified by weight and randomly assigned to the remaining 8 blocks, and grazing was initiated. In Experiment 1, a 0.76 m x 3.05 m strip of forage was cut out of the middle of each plot pre- and post-grazing, weighed fresh and subsampled for determination of dry matter (DM) yield, quality components, and calculation of total forage DM consumed from each plot. Forage subsamples were dried at 50 °C for 48 hours, ground to 1 mm particle size, and analyzed for crude protein (CP) (AOAC, 1990), neutral detergent fibre (NDF) and acid detergent fibre (ADF) (Goering & Van Soest, 1970). For Experiment 2, all plots were visually evaluated to determine extent of pasture use after 4 hours, 24 hours and 48 hours grazing. Two observers assigned each plot an ocular preference score (Shewmaker *et al*., 1997) from 1 (no grazing) to 10 (completely grazed).

Preference (DM consumed) and forage quality data for Experiment 1 were analyzed as a randomized block, while preference data from Experiment 2 (ocular preference score after 4, 24, and 48 hours grazing) were analyzed as a randomized block with repeated measures analysis using a GLM procedure (SAS, 1992).

Results

In Experiment 1, forage availability at the initial grazing was highest for AU Robin crimson, R18 rose, and Dixie crimson clovers, intermediate for Yuchi arrowleaf, and lowest for AU Sunrise crimson and Segrest ball clover (1137, 1023, 982, 491, 298, and 255 kg/ha, respectively). For the second grazing period, forage availability ranged from 838 to 446 kg/ha, with highest to lowest ranking for arrowleaf, ball, rose, Dixie crimson, AU Robin crimson, and AU Sunrise crimson clover, respectively. Crude protein and fibre concentrations also differed ($P < 0.05$) among the clover cultivars, with the cultivars ranking differently during each grazing period. During the initial grazing, forage CP, NDF, and ADF ranged from 24.2 to 18.5, 32.2 to 25.3, and 21.1 to 17.6%, respectively, while these constituents ranged from 23.4 to 18.2, 42.8 to 26.6, and 30.3 to 17.4%, respectively, in the second grazing period.

Table 1 Preference of Boer-Spanish cross goat yearlings for cool-season annual clovers

	First cutting (3/22-3/24/01)			Second cutting 5/14-5/16/01)		
	Grazing time					
Forage	4 hr	24 hr	48 hr	4 hr	24 hr	48 hr
	- - - - - - - - - - Ocular preference score[1] - - - - - - - - - -					
R18 rose clover	1.30[a]	2.1[a]	3.2[a]	1.0[a]	2.3[a]	4.7[a]
BYMV arrowleaf clover	2.16[ab]	3.3[b]	5.0[b]	2.8[b]	5.2[b]	7.0[bc]
Fungicide-coated Yuchi arrowleaf	2.21[bc]	3.7[b]	5.8[b]	4.0[c]	6.7[c]	8.3[cd]
Yuchi arrowleaf	2.50[bc]	3.8[b]	5.4[b]	4.5[c]	6.9[c]	8.8[d]
Dixie crimson clover	3.00[c]	5.9[c]	7.6[c]	NA[2]	NA	NA
Sunrise crimson clover	2.58[bc]	5.3[c]	8.2[c]	NA	NA	NA
Americus hairy vetch	2.63[bc]	3.5[b]	5.6[b]	3.9[c]	5.6[c]	6.8[b]
Standard error	0.29	0.36	0.44	0.32	0.45	0.57

[1]Ocular preference score 1-10: 1 = no grazing; 2 = <2%; 3 = 2-5%; 4 = 5-10%; 5 = 10-25%; 6 = 25-40%; 7 = 40-60%; 8 = 60-75%; 9 = 75-90%; 10 = completely grazed
[2]NA = forage not available
[a,b,c,d]Column means with unlike superscripts differ significantly ($P < 0.05$)

Despite differences in forage availability and quality indices in each grazing period, there was no effect of cutting date on DM consumed for the different clover cultivars, so data from the two grazing periods in experiment 1 were pooled. Total DM consumed by the goats averaged 372, 368, 322, 218, 145, and 100 g for Au Robin crimson, Dixie crimson, AU Sunrise crimson, arrowleaf, rose, and ball clovers, respectively.

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Consumption of Dixie and AU Robin crimson clover was significantly higher than for ball ($P < 0.05$) or rose ($P < 0.07$) clover.

In the initial grazing period in Experiment 2, yearling kids also preferred ($P < 0.05$) the crimson clover cultivars over the arrowleaf clover types and hairy vetch, with rose clover least preferred (Table 1). With no crimson clover available during the second grazing period, the kids preferred Yuchi arrowleaf clover without fungicide coating significantly ($P < 0.05$) more than BYMV arrowleaf, with rose clover preferred the least.

Discussion

Both mature and growing goats showed a preference for crimson clover over other clover types, and preference was not related to DM availability, CP or fibre in the different forages. Dixie crimson clover was lower in fibre and intermediate in CP concentration and DM yield, but was most preferred by the goats. Shewmaker *et al*. (1997) reported little relationship between DM yield and preference of grazing beef cattle for different cultivars of endophyte-free tall fescue (*Festuca arundinacea* Schreb.). These authors also reported higher repeatability and time savings for an ocular scoring technique compared with cutting before and after grazing to establish forage preferences of grazing animals. We confirmed these results in the current study. The coefficient of variation (CV) for the ocular preference scoring technique used in the second experiment averaged 34%, while the CV for cutting before and after grazing to establish preference (Experiment 1) was 49%. Although no direct comparison of the two techniques was done in the current investigation, the ocular preference scoring technique was much easier and appears to be an effective means of establishing grazing preference of goats.

Conclusions

Crimson clover was preferred by goats over other clover types and may be suitable as high-quality winter-spring pasture for goat production in the southern USA. Although less preferred than crimson, arrowleaf clover has a longer grazing season in this region and may also have potential for goat grazing. Further research is needed with these species to determine performance of goats grazing annual clover as a component of the diet.

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