

## Effects of feeding sericea lespedeza hay to goats infected with *Haemonchus contortus*

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### Abstract

Infection with gastrointestinal nematodes (GIN) is a primary constraint to economic goat production in the southern USA. Anthelmintic resistance is highly prevalent in goat nematodes in this region, and non-chemical control methods are needed. Grazing of forages containing condensed tannins (CT) or feeding purified CT as part of the diet has shown potential for reducing parasite egg counts in faeces of sheep and goats, but little information is available on feeding hay from CT-containing forages. The anthelmintic potential of sericea lespedeza [*Lespedeza cuneata* (Dum-Cours.) G. Don] hay was evaluated in an 8-week feeding trial with goats. Twenty yearling Spanish-cross does were given a single challenge of 10,000 *Haemonchus contortus* infective (L3) larvae to boost their naturally acquired parasite load. After three weeks grazing, the does were moved to pens (5 animals per pen) and fed either ground sericea or bermudagrass [*Cynodon dactylon* (L.) Pers.] hay diets (treatment n = 10) balanced for crude protein and energy with a small amount of supplement. All 20 does were fed the bermudagrass diet for a 1-week adjustment period, after which two pens of animals were switched to the sericea diet for four weeks (trial period). All the does were then fed the bermudagrass diet for an additional three weeks. Throughout the experiment worm egg counts (FEC; faecal egg count) were done weekly for each doe. Egg shedding was similar between the two groups prior to feeding the treatment diets, significantly lower in sericea-fed goats during the 4-week trial period, and again similar during the 3-week post-trial period. Feeding sericea lespedeza hay to goats reduced nematode egg shedding and may have potential to reduce pasture contamination from GIN larvae.

**Keywords:** *Haemonchus contortus*, sericea lespedeza, goats, condensed tannins

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### Introduction

In the southern USA, goat production for meat or milk is an attractive alternative enterprise for farmers because of the comparatively low cost of breeding stock, high reproductive rate of goats and their ability to thrive on native pastures or brushland that is unsuitable for cropping (Glimp *et al.*, 1986). In addition, the high ethnic demand for goat meat and milk products, particularly in large metropolitan areas in the USA, is exceeding current production levels. Despite the increasing demand, growth of the goat industry in the southern USA has been slow. The major hindrance to economic goat production in this region is infection with gastrointestinal nematodes (GIN), particularly *Haemonchus contortus*. The conventional method of GIN control by farmers in the Southeast is regular use of anthelmintics, sometimes monthly or more often during the warm season. Overuse and/or misuse of anthelmintics has led to increased anthelmintic resistance in GIN of goats, sheep and cattle in many parts of the world (Prichard, 1994), and recent reports from Virginia (Zajac & Gipson, 2000) and Georgia (Mortensen *et al.*, 2003) indicated that anthelmintic resistance in goats has become highly prevalent in the southern USA.

In many parts of the world the use of plants with anthelmintic properties is being considered as an alternative to anthelmintic drugs. Grazing forages high in tannins or adding purified CT to the diet has been shown to reduce numbers of parasite eggs in sheep and goat faeces in a number of studies (Niezen *et al.*, 1998; Athanasiadou *et al.*, 2000; Min & Hart, 2003; Paolini *et al.*, 2003a). However, there have been very few reports on anthelmintic effects of feeding hay from CT-containing forages, although Paolini *et al.* (2003b) reported lower egg counts in faeces of goats fed sainfoin (*Onobrychis viciifolia* Scop.) hay, compared with grass hay. The

purpose of the current study was to test for potential anthelmintic effects of feeding sericea lespedeza hay to goats.

### Materials and Methods

A study was completed at the Fort Valley State University Agricultural Research Station, Fort Valley, GA., USA, from October-December, 2003. Twenty yearling Spanish x Boer x Kiko cross does were randomly assigned to two treatment groups of 10 goats each based on faecal egg count (FEC). One group was fed a diet of coarse-ground sericea lespedeza hay and the other with bermudagrass hay in an 8-week confinement study. The diets were balanced for protein and energy with a small amount of supplement (ground maize, soyabean meal, poultry fat, trace mineral salt and vitamin premix). The diets comprised approximately 80% hay and 20% supplement by weight. Prior to starting the trial, the does acquired a low-level natural GIN infection (< 200 FEC; 97% *H. contortus*) by grazing native pasture for approximately six months. Three weeks before moving the does to the pens (2 pens of 5 animals each for each treatment) the infection levels of the does were boosted by a single drench of 10,000 *H. contortus* larvae per animal.

Upon entry into feeding pens, all the goats were fed ground bermudagrass hay during a 7-day adjustment period, after which two pens of goats were switched to the sericea hay ration. After four weeks on the experimental rations, all of the goats were again given the bermudagrass ration for an additional three weeks. The goats were given a small amount of concentrate (as required to balance the two rations for crude protein and energy) daily throughout the trial, with *ad libitum* access to hay and water. The concentrate feeding was held constant, while the hay ration for each pen was adjusted daily to allow 10% uneaten feed. Throughout the 8-week experiment, FEC was monitored in all does on a weekly basis. Faecal egg count data were analyzed by repeated measures analysis (SAS, 1992). The pre-trial (sampling dates 1-3), trial (sampling dates 4-8) and post-trial (sampling dates 9-11) periods were analyzed separately.

### Results

*Haemonchus* egg counts were similar between the two groups during a 3-week pre-trial period (Table 1). During the 4-week trial period, treatment, time and treatment x time effects were all significant ( $P < 0.05$ ). Faecal egg counts were lower ( $P < 0.05$ ) in the sericea-fed group, with the difference increasing in size over time. After the sericea-fed goats were switched back to bermudagrass, there were no significant differences in FECs during weeks 9-11, although they were numerically lower in animals previously fed sericea.

**Table 1** Worm egg counts in naturally infected goats given an artificial booster infection of *Haemonchus contortus* larvae and fed diets of ground sericea lespedeza or bermudagrass hay and a small amount of concentrates

Diet	Sampling times (weeks after parasite challenge) <sup>1</sup>									
	Pre-trial period <sup>2</sup>			Trial period <sup>3</sup>					Post-trial period <sup>4</sup>	
	1	2	3	4	5	6	7	8	9	11
	----- Parasite eggs per gram of faeces -----									
Bermudagrass hay + concentrates	300	179	321	179	357	221	436 <sup>a</sup>	5150 <sup>a</sup>	1314	514
Sericea lespedeza hay + concentrates	238	263	88	207	107	64	36 <sup>b</sup>	729 <sup>b</sup>	233	0
Standard error	139	106	185	49	182	57	85	1239	530	337
Prob. for TRT main effect	0.76	0.59	0.40	0.69	0.35	0.08	0.01	0.03	0.20	0.32

<sup>1</sup>A separate statistical analysis was completed for each period

<sup>2</sup>Goats grazed on pasture for three weeks, moved into pens after week 3, fed bermudagrass diets for 1 week

<sup>3</sup>Half the animals switched to sericea diet after week 4, through week 8

<sup>4</sup>After week 8, all animals switched back to bermudagrass diets through week 11

<sup>a,b</sup>Column means with unlike superscripts differ significantly ( $P < 0.05$ )

## Discussion

Grazing of tannin-containing forages has been suggested as an alternative to chemical anthelmintics for controlling gastrointestinal nematodes in both sheep and goats (Niezen *et al.*, 1998; Min & Hart, 2003). However, there are limitations to this approach, particularly the lack of suitable pasture forages that contain considerable levels of CT. Based on the results of the current study, feeding hay of CT-containing forages to control parasitic nematodes appears to be a viable alternative to grazing CT forages for goats. Feeding hay may also allow these benefits to be realized with other species, such as cattle, sheep or horses, although this remains to be tested. Cattle and sheep do not like to graze sericea lespedeza, but readily consume it as hay (Terrill *et al.*, 1989).

Although goats fed the sericea hay had lower FECs than those fed bermudagrass hay, these differences were not significant after sericea feeding had stopped, suggesting a greater effect on worm fecundity than on worm numbers. This is supported by the work of Min & Hart (2003), who reported reduced FEC in goats grazing sericea lespedeza, but that was quickly lost when the animals were switched to tall fescue (*Festuca arundinacea* Schreb.) pastures. In contrast, Paolini *et al.* (2003b) reported that FEC remained lower in goats fed hay from sainfoin, compared with grass hay for two weeks after sainfoin hay feeding had been stopped. These authors suggested a possible effect on worm numbers. The animals used in the current study were from our breeding herd and could not be slaughtered for worm counts. Reduced fecundity could have a large effect on reducing pasture contamination, however. Potential anthelmintic properties of sericea lespedeza hay in goats need to be tested when fed as a supplement to naturally-infected animals under grazing conditions.

## Conclusions

Feeding hay of sericea lespedeza to goats reduced gastrointestinal parasite egg counts, compared with FECs of goats fed bermudagrass hay, and may be an effective means of reducing egg shedding on pasture. Evaluation of the anthelmintic potential of feeding hay of CT-containing forage to grazing goats is needed.

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