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Effect of supplemental sericea lespedeza leaf meal pellets on gastrointestinal nematode infection in grazing goats

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ABSTRACT

Feeding sun-dried sericea lespedeza [SL; *Lespedeza cuneata* (Dum-Cours.) G. Don.] reduces gastrointestinal nematode (GIN) infection in goats fed in confinement, but effects of this forage when fed as a supplement to goats on pasture are unclear. A study was completed in which supplemental feeds (75 and 95% SL leaf meal pellets and a commercial pellet, all fed at 0.91 kg/head/day) were offered to thirty growing male Spanish goats (9 months old, 20.6 ± 2.8 kg, 10/treatment) grazing perennial warm-season grass pastures in Fort Valley, GA, from September to November, 2010. Fecal and blood samples were taken from individual animals weekly to determine fecal egg count (FEC) and packed cell volume (PCV), respectively, and animal weights were recorded at the start and end of the trial. After 11 weeks grazing, animals were slaughtered for recovery, counting, and speciation of adult GIN from the abomasum and small intestines. There was no difference in FEC between goats fed the 75 and 95% SL leaf meal pellets, but both groups had lower ($P < 0.05$) FEC than the goats fed the commercial pellets from days 35 to 77. The PCV values were not affected by the dietary treatments. Animal gain per day averaged 102.0, 77.2, and 53.3 g for goats fed 95% SL, commercial, and 75% SL pellets, respectively ($P < 0.05$). The 95% SL leaf meal pellet goats had 93.0 and 47.3% fewer ($P < 0.05$) total (male + female) adult *Haemonchus contortus* and *Teladorsagia circumcincta*, respectively, than control animals, while only male *H. contortus* were lower (47.6%; $P < 0.05$) in 75% SL-fed goats compared with commercial pellet-fed animals. Feeding supplemental SL leaf meal pellets improved animal performance (95% SL pellets) and reduced worm burdens (75 and 95% SL pellets) in young grazing goats and is a useful tool for natural GIN control in small ruminants.

1. Introduction

Gastrointestinal nematodes (GINs) are a major factor causing decreased productivity of livestock worldwide, especially in grazing animals (Parkins and Holmes, 1989). Poor growth rates, reduced reproductive performances, increased mortality, and low quality products from infected animals eventually increase production costs, and the problem is worse in tropical and subtropical regions because of high prevalence of infected pastures due to favorable environmental conditions for parasites to survive in their free-living stage (Waller, 1997a,b). Poor quality forages, especially during the warm season, and extensive grazing on unimproved pastures, together with lack of supplemental nutrients, increases susceptibility to infection (Wan et al., 1989). Anthelmintic drug treatment has

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Table 1
Chemical composition of supplemental 95% sericea lespedeza (SL) leaf meal, 75% SL leaf meal, or commercial pellets offered to grazing goats (all values expressed on dry matter basis).

Pellet	Constituent						
	ECT[a]	PBCT	FBCT	TCT	CP %	NDF %	ADF %
Commercial	0.0	0.0	0.0	0.0	19.6	15.0	9.4
75% SL leaf meal	3.51	2.13	0.02	5.66	18.5	23.1	17.1
95% SL leaf meal	3.10	2.57	0.04	5.71	15.1	26.2	20.3

[a] ECT = extractable condensed tannin; PBCT = protein-bound condensed tannin; FBCT = fiber-bound condensed tannin; TCT = total condensed tannin; CP = crude protein; NDF = neutral detergent fiber; ADF = acid detergent fiber.

historically been the most common control method against GIN infection. However, there has been overuse and misuse of this approach in the last 4–5 decades, which has led to a world-wide increase in prevalence of anthelmintic resistance among major nematode species in small ruminants (Bjorn et al., 1990; Ngomuo et al., 1990; Prichard, 1994; Lans and Brown, 1998). In a report from Georgia, over 90% of goat farms had high levels of GIN resistance to ivermectin and albendazole (Terrill et al., 2001). In a more recent report, Howell et al. (2008) reported total anthelmintic failure (resistance to all available anthelmintics) on 17% of sheep and goat farms throughout the southeastern USA. Therefore, alternative, sustainable methods of control that are less reliant on chemotherapeutics are urgently needed.

There have been a number of reports documenting reduced GIN infection levels in sheep and goats grazing condensed tannin (CT)-containing forages, including sulla (*Hedysarum coronarium* L.), birdsfoot trefoil (*Lotus corniculatus* L.), big trefoil (*Lotus uliginosis* Schkuhr.), and sericea lespedeza [SL; *Lespedeza cuneata* (Dum-Cours.) G. Don.] (Niezen et al., 1995, 2002; Min and Hart, 2003; Min et al., 2004; Shaik et al., 2006; Terrill et al., 2009). Apart from parasite control, CT can also help to increase protein utilization efficiency by the animal (Mueller-Harvey, 2006; Scharenberg et al., 2007) and decrease the incidence of bloat by altering ruminal gas production and soluble protein digestibility from highly digestible forages (Min et al., 2005).

There are some limitations to the use of fresh CT forages, including seasonal growth patterns, land requirement for grazing CT forages, and unfavorable economics with some plant species. To help overcome these problems, dried forms of CT forages can be used. There are a number of reports showing good anti-parasitic efficacy of sun-dried SL (Shaik et al., 2004, 2006; Dykes et al., 2006; Lange et al., 2006; Terrill et al., 2008), sainfoin (*Onobrychis viciifolia* Scop.; Paolini et al., 2003), and acacia (*Acacia karoo*; Kahiya et al., 2003). Pelleted SL hay maintained its anthelmintic effectiveness against GIN of goats and could potentially increase the utility of this forage as a natural deworming agent for small ruminants (Terrill et al., 2007). All of these reports involved feeding dried forages to parasitized animals in confinement trials. There have been no published reports on the effect of supplementation with CT forage pellets on GIN infection in grazing goats.

Bermudagrass [*Cynodon dactylon* (L.) Pers.] is well-adapted to the southeastern USA, except on poorly drained soils, and is the primary pasture grass in this region. Forage quality of perennial warm-season grasses, including bermudagrass, is generally lower than that of cool-season grasses, and at the same time, transformation of *Haemonchus contortus* eggs into infective (L_3) larvae is much higher during warmer months when warm-season grasses are growing (Eysker et al., 2005). Supplementing perennial warm-season grass pasture with SL pellets may help to control GIN and improve performance of meat goats under perennial grass-based grazing systems.

The objective of this research to test the effectiveness of supplementing with SL pellets to control GIN and improve performance of goats grazing perennial warm-season grass pasture during late summer/autumn.

2. Materials and methods

2.1. Experimental animals and design

An experiment was conducted at the Fort Valley State University (FVSU) Agricultural Research Station, Fort Valley, GA, and all husbandry practices and experimental procedures used in the study were approved by the FVSU Animal Care and Use Committee. All animals were naturally infected by grazing contaminated pastures before the experiment was started. Animals with blood packed cell volume (PCV) ≤ 15 at any time throughout the study period were dewormed with a combination of levamisole and doramectin.

The experiment was completed during the late summer–autumn grazing season on mature perennial warm-season grass pastures ((primarily bermudagrass and bahiagrass (*Paspalum Notatum* Flugge.)). Treatment paddocks (0.32 ha) each contained an automatic feeder (Tarter Farm and Ranch Equipment, Dunnville, KY) in which supplemental feed pellets were offered to grazing goats. Thirty naturally-infected intact male Spanish kids (9 months old, 20.6 ± 2.8 kg) were stratified by FEC and randomly assigned to 3 groups (*n* = 10/group), with each group then randomly assigned to the 3 pastures. The goats were offered 0.91 kg/head/day of 1 of 3 pelleted rations: (1) 95% SL leaf meal, (2) 75% SL leaf meal, or (3) commercial (control) pellets (Table 1). The goats began consuming all three diets immediately after they were offered, and there were no pellets left in the automatic feeders at the end of each feeding period (24 h).

The 75 and 95% SL pellets were made from two different cuttings of SL hay grown in Central Alabama (Sims Brothers Seed Company, Union Springs, AL). The 95% SL pellets were made at the FVSU Agricultural Research Station using a small pellet mill (California Pellet Mills, Ames, IA)