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Livestock Research

Goat Grazing to Reduce Parasite Loads

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In a Nutshell

- Internal parasites are an important issue in goat production, and parasite resistance to drugs is prevalent.
- Grazing management, including frequent rotations and providing browse, reduces the likelihood that goats ingest larvae.
- Reductions in FAMACHA score and some fecal egg counts were observed following grazing interseeded pastures.

Key findings:

- At Frog Hollow Farm, FAMACHA scores did not change throughout the grazing season, but fecal egg counts were lower after interseeded pastures had been grazed.
- At Girl and a Goat Farm, FAMACHA scores and some parasite fecal egg counts were lower in goats grazing seeded pastures.

Project Timeline:

May to October 2014

Goats at Frog Hollow Farm graze a mixed-species pasture.

Background

Resistance of internal parasites to common dewormers and anthelmintic products has been a concern for small ruminant farmers. The American Consortium for Small Ruminant Parasite Control (ACSRPC) notes that goats have weaker immune responses to worms than other small ruminants, and overuse of certain chemicals has rendered them totally ineffective (Hart 2008). Species such as Haemonchus contortus (the barber pole worm) cause economic loss through poor animal performance and production, and may lead to death if infestation is not controlled (Hart 2008). Organic farmers or those desiring to limit chemical use have had limited success with herbal dewormers and other supplements (Bernard et al. 2009, Burke et al. 2009).

Parasite load in a goat herd can be reduced through killing existing parasites and preventing ingestion of new ones. Certain forage species act as natural dewormers, particularly those high in condensed tannins (sericea lespedeza and birdsfoot trefoil) and sesquiterpene lactones (chicory) (Coffey et al. 2007; McCutcheon et al. 2012a). Parasite eggs passed in feces hatch and the larvae crawl onto grass, where they are consumed by grazing animals. If left exposed too long they will die; managing rotations to prevent early re-entry of animals into an infested paddock or providing a "clean pasture" partway through the grazing season will reduce ingestion (Hart 2010; McCutcheon et al. 2012b). Goats are natural browsers whereas larvae concentrate closer to the ground, so brush or browse as a forage source instead of grass will limit ingestion of larvae.

PFI cooperators selected management changes that were feasible on their operations and reported the effects of implementation on parasite load and animal health and production.

Materials and Methods

Cooperators selected at least one management technique to implement.

- Interseeding new forages: sericea lespedeza, birdsfoot trefoil, chicory (as natural anthelmintics); or BMR sorghum-sudangrass (for summer "clean" pasture).

- Strip grazing: subdivide pastures with temporary fence and rotate animals to a new strip every 3-5 days, before larval emergence.
- Extending rest periods: aim for at least 30 days of rest between grazing events, and aim for mean forage height of 8 inches before grazing.
- Brush and woodland grazing: frequently rotate animals in forested or wooded areas to prevent animals from grazing less than 2 ft above the ground.

Depending on the selected techniques, data collection somewhat differed. In all cases, general pasture management and rotation scheme were reported, including days grazed per pasture and pasture size. For interseeded pastures, diversity transects were completed at least twice (before grazing and in midsummer or early fall). For other pastures, the forage height and/or biomass was determined.

The number, age, sex, and physiological states of animals in the grazing herd were reported. Animal health and well-being were recorded. Growing animals were weighed at least at the beginning and end of the trial; monthly if possible. Mature animals were body condition scored at least monthly.

Parasite load was quantified through FAMACHA scores and/or fecal egg counts. FAMACHA scoring was done on at least half of the herd every two weeks. FAMACHA scores (1-5) are based on the paleness of the inside of the goats' eyelids. A score of 5 (very pale eyelids) means the animal is anemic and has a high parasite load. A score of 1 (very pink eyelids) means the animal is not anemic and likely has a low parasite load. Fecal samples were collected from at least six representative animals three times during the trial period, and submitted to the ISU Vet Diagnostic Lab. Any animals showing signs of severe parasitism were treated with chemical wormers, as were any animals with high FAMACHA scores (4 or 5) or high fecal egg counts (750 eggs/g for lactating does, 1000 eggs/g for kids, 2000 were weighed at birth and at weaning, the weaning weights were adjusted for a standard 90-day weaning age, and average daily gain (ADG) was calculated.

Results and Discussion

Frog Hollow Farm

Cheryl and Mike Hopkins raise a herd of about 80 Boer-based does, along with finishing kids and a few bucks. Aside from some creep feed for the kids around weaning time, the animals eat nothing but grass, rotationally grazing through their five pastures. During the winter they have some pasture access but are given grass hay. Last year (Dunn 2013) they frost-seeded some pastures with legumes and herbal blends including plantain, sheep's parsley, and chicory. In March 2014 they frost-seeded crimson clover, chicory, and sericea lespedeza on some pastures (**Table 1**). Throughout the summer, they tracked the does' rotations through the pastures, checked FAMACHA approximately every two weeks, and took fecal samples three times.

Six does were selected for fecal sampling and FAMACHA scoring. Average FAMACHA scores ranged from 2.3 to 3.5, which is acceptable (**Figure 1**). A few individual scores of four were observed, and these does were chemically dewormed. The overall trend was downward for FAMACHA scores, though not strongly. Observations in the figure marked with an asterisk (*) were taken when does were in or had recently been in the pastures seeded with sericea lespedeza. There did not appear to be a strong correlation between grazing those pastures and reduced FAMACHA score, though there is a slight downward trend over time. It is possible that a low percentage of sericea or the poor palatability of the forage kept goats from consuming much of it. It is also likely that after winter management, where goats are more often indoors and more concentrated, movement to pasture of any sort helps alleviate parasite load by moving the goats from highly-infested areas.

Table 1 Pastures and Seeding Treatments at Frog Hollow Farm

Pasture ID	Size (ac)	Date seeded	Species seeded	Rate (lb/ac)	Previous seeding
A	5	Mar-14	crimson clover and sericea lespedeza	5.5 for CC, 11 for SL	Mar-13: herbal blend, alfalfa, red clover
B	7.5				Mar-13: alfalfa, red clover
C	5				Mar-13: birdsfoot trefoil, red clover, forage brassica, chicory
D	11	Mar-14	2 ac: crimson clover, sericea lespedeza, chicory	5.5 for CC, 11 for SL, 10 for chicory	
E	1.5	Mar-14	crimson clover and sericea lespedeza	5.5 for CC, 11 for SL	Mar-13: birdsfoot trefoil, red clover, forage brassica

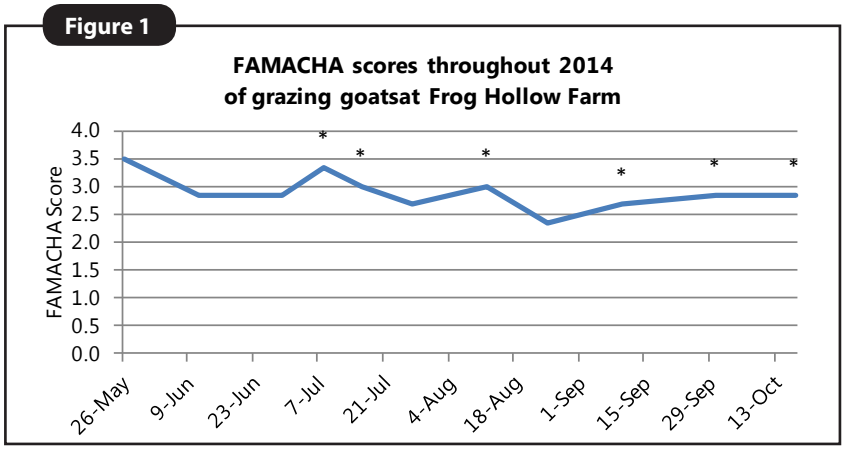
Cheryl and Mike used the line-transect method to observe pasture A for forage species diversity and change over time. **Table 2** shows the average percentage of each forage category (grasses, legumes, and broadleaf forbs) along with which species were present. While the proportion of forbs did not change, it seems that legumes (including sericea lespedeza) took hold and were a large part of the pasture by September.

Fecal samples were collected three times and analyzed using a McMaster floatation

Table 2 Forage species diversity on two dates in an interseeded pasture at Frog Hollow Farm

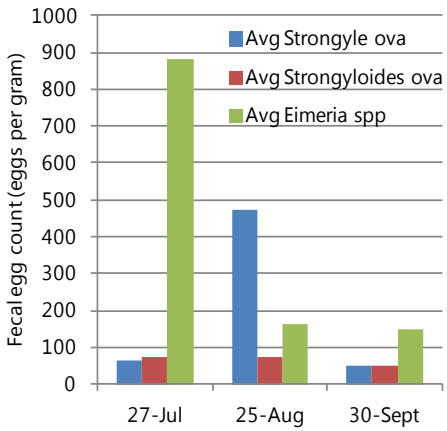
Forage	19-May % of total forage	1-Sep % of total forage	Species
grass	71.8	46.8	brome, fescue
legume	23	48.3	red and dutch clover, sericea lespedeza, alfalfa
forb	4.8	4.8	chicory, plantain, dandelion, Queen Anne's Lace
bare	0	0	

Figure 1



by the Iowa State Veterinary Diagnostic Lab (Ames, IA). Overall worm eggs counts (in eggs per gram, EPG) were lower at the final sampling than the initial (**Figure 2**). Strongyles are of particular interest, as the notable Haemonchus contortus is of this variety. Strongyloides worm infestations generally are short-lived and not of huge economic or health importance. Eimeria represents various forms of coccidia, a particularly nasty diarrhea-causing pest of youngstock.

Figure 2



In addition, the number of goats with each egg type in the feces also declined over time. By the final fecal sampling, one doe had no visible eggs (**Table 3**).

Cheryl and Mike's results suggest that grazing interseeded herbal species – sericea lespedeza, chicory, sheep's parsley, and others – correlate with reduced parasite loads in the feces of their grazing does. Hopefully by adding more of those herbals and even more frequent rotations, FAMACHA scores will also decrease, and the incidence of parasitism will be low enough that no animals need to be treated with chemical dewormers.

Girl and a Goat Farm

Dawn Anderson manages around 20 mature and young Boer-based goats, rotating them through pastures and supplementing with some concentrate. She seeded a portion of her pastures with BMR sorghum-sudangrass and birdsfoot trefoil in March 2014, followed in April by cereal rye, forage collards, camelina (a brassica), and sunn hemp. The mixture should provide better nutrition (increased protein from legumes), high grazing (sorghum-sudangrass), anthelmintic properties (birdsfoot trefoil), and better pasture diversity overall. Dawn allowed approximately half of the herd to graze the seeded pasture, while the other half were in the remaining bromegrass-based pasture. FAMACHA, and BCS were evaluated every four weeks from May through September. Fecal samples were taken from six animals, four from the seeded and two from the control pastures.

Average FAMACHA scores of each group of animals over time is displayed in **Figure 3**. Goats in the seeded pastures scored an average of 0.3 lower than goats in the control pastures, suggesting that the added forage species were beneficial to the goats. In both cases, the group average score stayed below four. While ideally animals would score only one or two, anything under four does not mandate immediate deworming.

Average BCS of the two groups is shown in **Figure 4.** BCS decreased over time in both treatment groups, but was of an acceptable level. A BCS of three is ideal, meaning the animal is not lacking for nutrients, but is also not overly fat. Lactating does tend to lose BCS, which may have dragged down the herd average. BCS did not differ between the two treatment groups, despite the added forage varieties. Dawn reported that precipitation and temperatures in summer 2014 were wonderful: "My pasture is overflowing! I could have a calf or two in with the goats this year," she says. Both groups, it seems, had adequate forage for kids to grow and adults to maintain weight.

Fecal samples were analyzed three times during summer 2014, the first by sugar floatation (qualitative analysis) and the final two by McMaster floatation (quantitative analysis, as done at Frog Hollow Farm) (**Table 4**). Samples were taken from four animals in the seeded pastures and two in the control pastures. In the sugar floatation, the parasites identified included Trichostrongylus, which like Haemonchus, are stomach worms with noted anthelmintic resistance; and Trichuris (whipworms) and Eimeria (coccidia) which are more common in young animals or if concentrate is fed on the ground.

Sugar floatation results from June 12, 2014 indicated that animals in the control pasture had a lower incidence of the three identified parasite types. Very few Trichuris were seen in goats from the control pasture, whereas the goats in the seeded pasture had a noticeable amount. Goats from both pastures had a moderate to high number of Trichostrongylus and Eimeria. The later McMaster floats showed that goats in seeded pastures always had lower levels of Strongyles but much higher levels of Strongyloides and Eimeria.

Table 3

Fecal egg counts and incidence of parasites in grazing goats at Frog Hollow Farm							
Species	31-Jul		28-Aug		2-Oct		% reduction Jul-Oct
	EPG	Incidence	EPG	Incidence	EPG	Incidence	
Strongyle ova	62.5	4 of 6 goats	475	2 of 6 goats	50	2 of 6 goats	20.0
Strongyloides ova	75	2 of 6 goats	75	2 of 6 goats	50	1 of 6 goats	33.3
Eimeria spp	880	5 of 6 goats	162.5	4 of 6 goats	150	5 of 6 goats	83.0

Figure 3

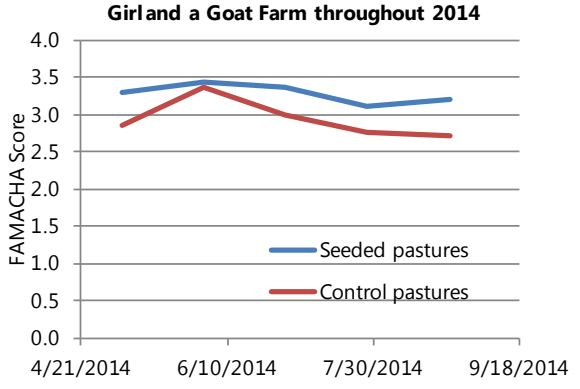
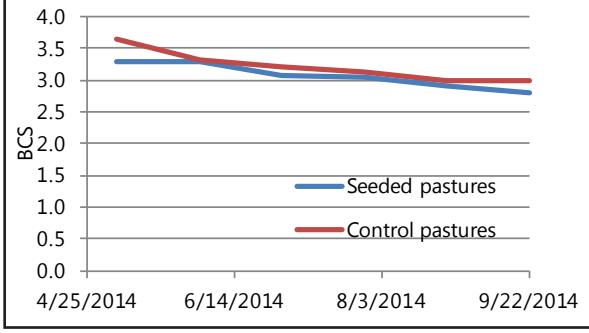


Figure 4



Recalling that Strongyles include Haemonchus, this result is consistent with observations that FAMACHA scores were lower for goats in seeded pastures. Perhaps the tannins do not target them as well, or the animals are simply more susceptible to parasites, or the timing of sampling was such that fecal floatations were done during a flush of parasites. Still, it is surprising that the other parasite types were more prevalent in goats from seeded pastures, particularly considering that the other species in addition to Strongyles decreased over time in the seeded pastures at Frog Hollow Farm. Except for Strongyloides in goats from seeded pastures, the parasite loads decreased from August to October. Strongyle levels decreased more in goats from seeded than control pastures, suggesting again that the anthelmintic forages may target only worms much like Haemonchus. And, just as noted at Frog Hollow Farm, movement to pastures in the spring may help reduce parasite load by moving animals from areas of concentrated manure. Dawn's goats have access to pasture during the winter, but spend more time in barns to stay out of the elements.

Table 4

Species	Fecal egg counts of Strongyle, Strongyloides, and Eimeria spp. in goats grazing seeded or control pastures at Girl and a Goat Farm					
	19-Aug		8-Oct		% reduction Aug-Oct	
	EPG, seeded	EPG, control	EPG, seeded	EPG, control	Seeded	Control
Strongyle ova	465	525	300	450	35.5	14.3
Strongyloides ova	387.5	75	1225	50	-216.1	33.3
Eimeria spp	11150	7500	2100	525	81.2	93.0

Dawn's results suggest that grazing interseeded forages – sorghum-sudangrass, forage collards, birdsfoot trefoil, camelina, and sunn hemp – was correlated with some reduced parasite loads. Lower FAMACHA scores and Strongyle ova counts in fecal samples were observed in goats grazing the seeded pastures. Other forage mixes or slightly varied rotations may help reduce the egg counts of other parasite species in the future.

Conclusions

Two sets of cooperators, Mike and Cheryl Hopkins, and Dawn Anderson, used alternative grazing strategies in an effort to reduce parasite loads in their goats. The Hopkins' added herbal species and more frequent rotational grazing, and observed a slight downward trend in FAMACHA scores over time, as well as strong reductions in fecal egg counts. Dawn added some tall and some naturally anthelmintic forages to one of her two main pastures, and observed reduced FAMACHA scores and Strongyle egg counts in goats grazing the seeded pasture.

The cooperators will continue this project for the next one or two years, during which time they will hopefully see the interseeded forages persist and increase in abundance, and will see improved indicators of parasitism in their animals.

PFI Cooperators' Program

PFI's Cooperators' Program gives farmers practical answers to questions they have about on-farm challenges through research, record-keeping, and demonstration projects. The Cooperators' Program began in 1987 with farmers looking to save money through more judicious use of inputs. If you are interested in conducting an on-farm trial contact Stefan Gailans @ 515-232-5661 or stefan@practicalfarmers.org.

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