Organic Methods to Manage Parasites in Sheep and Goats

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Forage-based Parasite Control In Sheep and Goats In the Northeast U.S.

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Haemonchus contortus

• Barberpole worm, Bankrupt worm
• Intestinal parasites of sheep and goats, related species attack other grazing animals.
• Limiting factor in organic production for small ruminants.

http://www.noonfamilysheepfarm.com/thenoonfamilysheepfarm_files/contortus.jpg
Life Cycle of *Haemonchus contortus*

http://www.pubs.ext.vt.edu/410/410-027/410-027.html
Life Cycle
• Eggs deposited in feces, hatch as J1, feed on bacteria, and molt to J2.
• Mature to Infective J3 in ~ 4 Days under optimum conditions. J3 is “filariform”.
• J3 climbs grass blades in film of moisture, has “sheath.”
• J3 ingested by sheep, molt in stomach to J4, then adult.
• Attaches to lining of abomasum (fourth stomach), ingests blood causing severe anemia, stunted growth, diarrhea, swelling of lymph glands, and death.
• Life cycle tied to sheep, egg-laying maximal just before lambing.
Symptoms

• Weakness and anemia
  • Paleness of gums and under eyelids
• Poor weight gain, weight loss, unthriftiness.
• Brittle wool
• Bottle jaw
• Death
• Diarrhea is rare and usually associated with other parasites, not Haemonchus.
Diagnosis

• Weight loss, poor performance, weakness
• Bottle Jaw
• FAMACHA
• Fecal Egg Counts
• Autopsy
Collecting fecal samples to assay for Intestinal parasites.
Conventional Management Options

• Antihelminthics
  • Ivermectins, Levamisole, Thiabendazole.
  • Anthelminthic resistance
  • Managed with selective treatment - FAMACHA

• Confinement feeding
Organic Management of *Haemonchus*

- Avoidance. Rotational grazing for prevention.
- Anthelminthics (Copper Oxide Wire Particles, medicinal plants)
- Breeding Programs - Select for genetic resistance. Use resistant breeds (hair sheep)
- Sheep resistance to intestinal parasites also determined by antibodies, diet, age.
  - Maintain low levels of parasitism.
  - High protein diets,
  - High condensed tannins.
  - Lambs most susceptible, need most intensive management.
“Safe Pastures” program.

- Includes Pastures that are:
  - Pastures previously harvested for hay or silage.
  - Mixed species rotational grazing.
  - Pastures not grazed for at least one year.
Avoidance Grazing

• Avoid exposure to infective larvae
• Rotate paddocks every three days in optimum weather (temp above 50 F with free moisture).
• Return no sooner than 60 days.
• Minimize excessively close grazing.
Drawbacks to Avoidance Grazing

• Labor intensive,
• Poor forage quality, sheep prefer younger forage.
• Is 60 days enough? May need longer rest period.
High Tannin Forages For Parasite Management

• Many reports suggest plants with high levels of condensed tannins are associated with reduced parasite problems.
• Condensed tannins are also called “Proanthocyanidins”, polymers of flavans (AKA Polyflavonoids, non-hydrizable tannins)
• Sericea lespedeza, wormwood, chicory, grape seeds, cranberry, pine and spruce bark.
• Helps prevent bloat, increases protein absorption.
Birdsfoot Trefoil.

- Well-adapted to Northeast US
- Weed competition is a problem until well established.
- Does well on low to moderate fertility soils.
- Nodulation is optimal at pH 6.0-6.5.
Establishing Birdsfoot Trefoil

• Use inoculated seed (*Rhizobium loti*), 6-12 lbs/A

• Well-prepared seedbed

• Plant ¼ inch deep

• Nurse crop (oats or barley at 1 bushel/acre).

• Best in early spring (before May 15) or late summer (July to Sept. 1) if adequate moisture.

• Frost seeding!
Use conventionally tilled, smooth firm seedbed.

No deeper than ¼ inch.

Cultipacker or Brillion seeder to firm the seed bed.

Photo courtesy of Cornell University Forage Breeding Project, Dr. Don Viands.
Managing Birdsfoot trefoil pastures

• Manage weeds or nurse crop early. Light grazing or mowing at ~8 inches.

• Begin grazing at 10% bloom, or 8-12 inches.

• Avoid grazing before seedling roots are well established. **Pull test!**

• Re-growth is from stem buds, not a tap root, avoid over-grazing (leave 4-inch stubble).

• Allow to grow to maturity to produce seed the first year, then every 2-3 years.

• Allow 4-5 weeks regrowth before the first killing frost.
A Guide for Establishing Birdsfoot Trefoil for Pasture and Hay

• http://web.uri.edu/sheepngoat/files/BFTestablishment _OREI-demo-farms_April20141.pdf

• Includes lots of internet links, resources, and contact info.
Managing Birdsfoot Trefoil Varieties: Stand Establishment and Grazing Preference

- Cv. Bull, Empire, Leo, Norcen established in 2012
- Four Weed Management treatments applied in 2013
  - Untreated Control
  - Mow at 15 cm
  - Low grazing Intensity (6 sheep/1000 ft² for one day)
  - High Grazing Intensity (6 sheep/1000 ft² for two days)
Results from Birdsfoot Trefoil Management Trial

• Sheep grazed 50-75% of BFT.
• Plots not mowed or grazed had more BFT in Year 1, but the least in Year 2.
• Weed management is critical to sustaining BFT stands.
Current Research: Forage-based Parasite Control

• Compare lamb performance on pastures with:
  • High-tannin BFT (cv. Pardee)
  • Low-tannin BFT (cv. Norcen)
  • Orchard Grass & Red Clover (control)

• Compare standard “Avoidance” grazing versus “Challenge” grazing.
  • Avoidance = 3-day grazing, 57 days rest before return.
  • Challenge = 7-day grazing, 21 days rest.
Current Research: Forage-based Parasite Control

• Parameters Measured:
  - pasture composition,
  - tannin levels,
  - Lamb FEC,
  - FAMACHA,
  - weight gain
  - organic status.
Pastures Planted April 2013
1 acre each

Grazed lightly in May,
Grazing Trial in June, 2014,
2 ewes + 4 lambs/plot

Grazing Trial repeated
with 4 lambs
Aug-4 to Sept. 30, 2014

Photo by Rebecca Uphold
Results from 2014 Grazing Trial

• Few statistically significant differences
• Weight gain was higher in blocks with best trefoil stand
• Fecal Egg Counts highest on Orchard Grass+Red Clover, lowest on Pardee (High Tannin cv.)
Organic Lambs at Harvest (9-29-14)

• Orchard Grass & Red Clover 4/8
• Norcen BFT (Low Tannin) 6/8
• Pardee BFT (High Tannin) 8/8
## Organic Lambs at Harvest

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
<th>2015</th>
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<tbody>
<tr>
<td><strong>Orchard Grass &amp; Red Clover</strong></td>
<td>4/8</td>
<td>3/8</td>
</tr>
<tr>
<td><strong>Norcen BFT (Low Tannin)</strong></td>
<td>6/8</td>
<td>5/8</td>
</tr>
<tr>
<td><strong>Pardee BFT (High Tannin)</strong></td>
<td>8/8</td>
<td>4/8</td>
</tr>
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Avoidance versus Challenge Grazing

<table>
<thead>
<tr>
<th>Treatment</th>
<th>FEC</th>
<th>% Organic Lambs</th>
<th>Body Wt (lbs)</th>
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<tbody>
<tr>
<td>Avoidance</td>
<td>1841*</td>
<td>83***</td>
<td>52*</td>
</tr>
<tr>
<td>(3-Day, 57-Day Return)</td>
<td></td>
<td></td>
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<tr>
<td>Challenge</td>
<td>3945</td>
<td>46</td>
<td>45</td>
</tr>
<tr>
<td>(7-Day, 21-Day Return)</td>
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* P = 0.06
*** P = 0.001
Trials to be repeated in 2016

Photo by Rebecca Uphold
Mode of Action
How does BFT suppress Haemonchus?

• Are Condensed Tannins toxic to nematodes?
• Do they change Nematode behavior in the rumen?
• Effects on Egg Production
• Egg Hatch?
• Do they stimulate the Immune system of sheep?
• Are some Condensed Tannins more active than others?
In vitro assay of egg hatch in water extracts from 51 BFT varieties versus concentration of Condensed Tannins.

No Correlation 😞
Other Management Options:

• Feed BFT hay?
• Medicine plots for infected animals?

• Efficacy is proportional to concentration of condensed tannins in diet; Will grasses, weeds or feed supplements dilute the benefits?
Questions?