

PASTURE AND GRAZING MANAGEMENT FOR PARASITE CONTROL

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How Goats Get Parasite Infection From Pasture?

Pastures contaminated with parasite eggs serve as a reservoir as well as provide environment to hatch these eggs to larvae. The larvae undergo few development stages (molting) and become infective. Under favorable conditions, infective larvae travel to the tip of forages and enter into grazing animals' digestive tract along with the forages these animals eat. This is the case of parasites having direct lifecycle (parasites that require only one host to complete their lifecycle) such as most of the roundworms of veterinary importance (Figure 1). For the parasites having indirect lifecycle (parasites that require more than one host to complete the lifecycle) such as liver flukes (snails are the intermediate host) and ruminant tapeworms (pasture mites are the intermediate hosts) (Urquhart et al., 1988), pastures provide the environment for the survival and development of parasite eggs and larvae as well as the intermediate hosts. Larvae of parasites having indirect lifecycle infect suitable intermediate hosts and complete certain developmental stages within the intermediate hosts. These larvae are either liberated into the environment (pasture) and then they infect the grazing animals (Figure 2) such as in the case of liver flukes, or grazing animals get infected after ingesting the intermediate host infected with parasite larvae (Figure 3) such as in the case of ruminant tape worms, where animals get infected after ingesting pasture mites with tapeworm larvae. Therefore, it is very important to properly manage the pasture and adopt suitable grazing practices to minimize the parasitic problems.

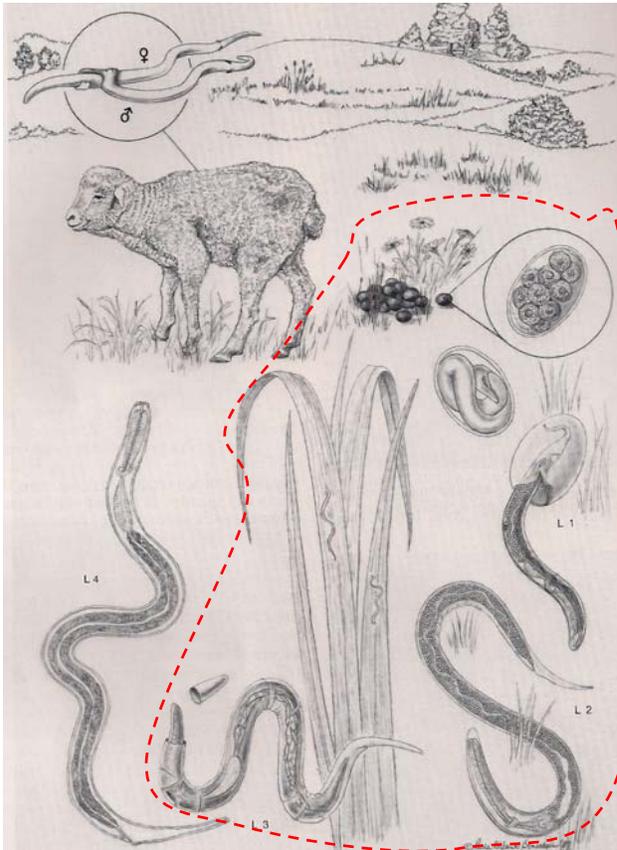


Figure 1. Typical roundworm lifecycle.
Steps inside the dotted line takes place in pastures.

Source: Adopted from (Bowman and Lynn, 1995)

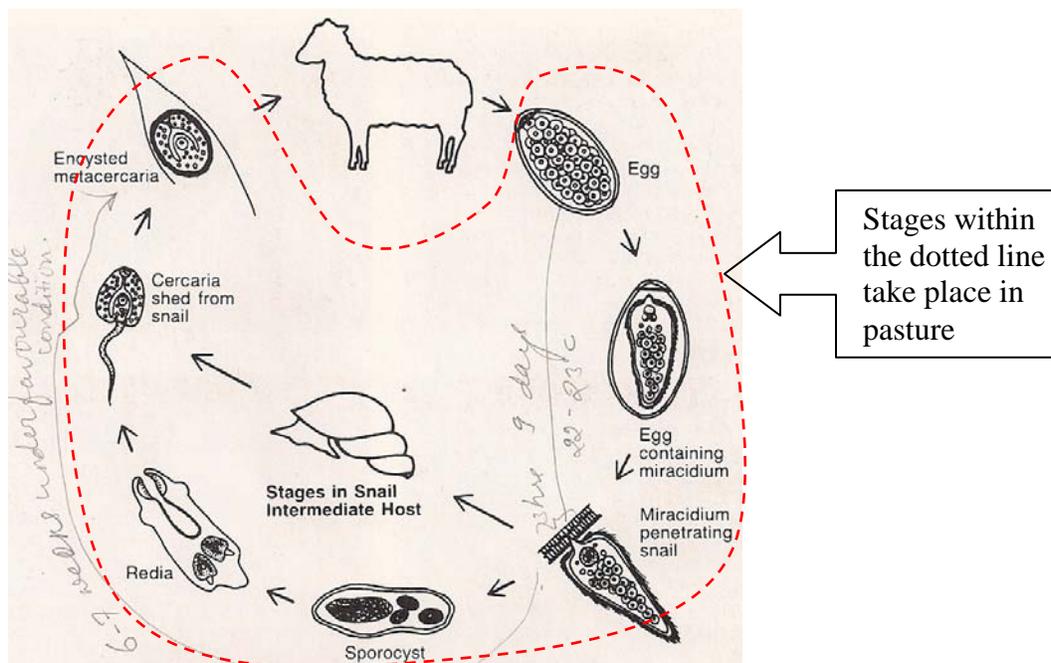


Figure 2. Liver fluke lifecycle and the stages that occur in pasture.

Source: Adopted from Urquhart et al. (1988)

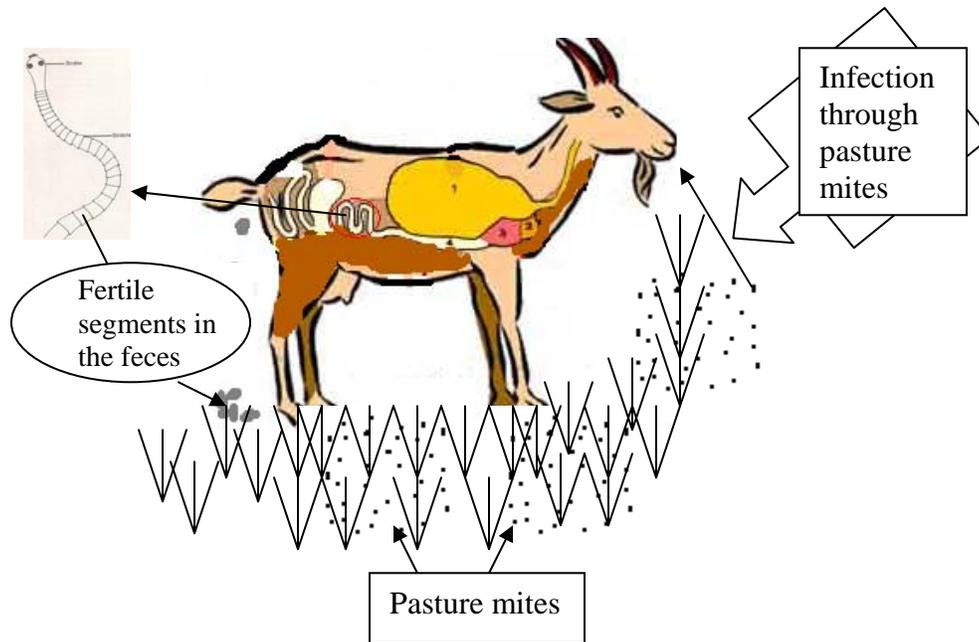


Figure 3: Typical ruminant tapeworm lifecycle.

What Pasture Situation is Favorable for Parasite Survival and Development?

Wet and warm (65°F–85°F; larvae survival and development is arrested beyond this temperature range) environment is favorable for the survival and development of parasite larvae in the pasture environment (Miller, 2004). Parasite larvae remain close to the ground up to a level where there is enough moisture for their survival. Moisture also serves as a medium for the travel of larvae. When there is a lot of moisture, larvae travel towards the tip of the forage so that they can reach to the grazing animals through the forages animals eat. When it is dry, larvae go back close to the ground surface and remain there until environment becomes favorable for them to travel up the forage again. Generally, the moisture available under the forage canopy is adequate for larvae survival. How long larvae remain alive in a pasture if they do not have chance to infect animals depends on how quickly they finish their energy reserves as they do not feed. Normally, the density of larvae remains high within 12-24 inch from the feces and 2-3 inches up the forage plants. However, parasite larvae can reach beyond 2-3-inch height on the forage plant when it is warm and wet. Therefore, it is recommended that goats should not be allowed to graze forages lower than 5 inches. Moreover, parasite density remains high in certain areas of pasture where fecal material is accumulated such as around water source, under the tree shade (during hot days), and around feeding areas. Also, parasite larvae population will usually be high in overstocked

pasture than in normally stocked or understocked pastures. Liver fluke prevalence will be high where there are water bodies (swamp areas) and snails.

What can be done to lower the Parasite Problem?

There are several things producers can apply at their pastures or grazing systems to lower the problem of internal parasites as listed below.

1. Include Condensed-Tannin Containing Forages

Tannin is a compound present in various forages like sericea lespedeza, chicory, mimosa, and birdsfoot trefoil (suitable for the northern parts of the Southeast). Several studies have shown that condensed tannin has detrimental effects on internal parasites of goats, sheep, and deer. Sericea lespedeza is a perennial warm-season legume and widely adapted in the Southeast (Ball et al., 2007). It is well suited in well-drained loam to clay soil from southern Ohio to central Alabama and from eastern Oklahoma to Atlantic coast. It is tolerant to drought condition and low fertility as well as acidic conditions. Its nutritive value is better than most perennial grasses. This forage can be planted for hay production as well as grazing, but continuous close grazing is not suitable for most of the varieties. 'Au Grazer' variety is most suitable under grazing condition (Ball and Mosjidis, 2003). However, rotational or controlled grazing is recommended for its persistence. Seed of this variety is available from Sims Seed Company, Union Springs, AL (334) 738- 2619.

Chicory is a short-lived (2-4 years, or 5-7 years with proper management) forb (neither grass nor legume). It is recommended for all parts of Southeast for pasture, but not suitable for hay production for its high water content. It can be grown together with tall fescue or bermudagrass when properly managed with rotational stocking. It is very tolerant of drought and acidic condition, but requires high fertility. It is very palatable and nutritious forage, and goats love it.

Mimosa trees can be introduced into the pasture or silvopasture setting. These trees are leguminous, so will provide quality fodder to goats along with tannin. Information on mimosa trees can be found from the local forest service office.

2. Include Browse and Tall Forages into the Grazing System

Goats love browsing as they are browsers originally. When exposed to multispecies pasture that include browse, grass, and forbs, goats derive 60 percent of their diet from browse (Walker, 1994). Since parasite larvae are concentrated under the pasture canopy, parasite infection of goats can be significantly lowered keeping the goats' head up such as when browsing. Like browse species, tall forages like sericea lespedeza, johnsongrass, and switchgrass help keep the goats' head up and minimize the parasite problem than when grazing short grasses such as bahiagrass and common bermudagrass. Goats will utilize brush and shrubs under woodland. However, allowing goats to graze short forages under trees already contaminated with parasites will worsen the parasite problem. It is because understory forage canopy will have more moisture due to tree shade, so provide favorable condition for parasite larvae survival.

3. Apply Mixed-Species Grazing

Cattle and goats complement each other by minimizing the parasitic larva of the other species as they do not share most of the gastrointestinal parasites with major pathogenic importance (Miller, 2004; Urquhart et al., 1988). When grazed together, each species dilute the parasite larvae of another species and thereby minimize the chance of infection. If co-grazing of cattle and goats is not possible or preferred, each species can be allowed to graze the pasture alternatively. However, one must be careful if there are young calves, which can be infected with *Haemonchus contortus* larvae, although the risk of parasite problem in calves is much less than in goats. Other than benefits of parasite control, mixed species grazing also offers higher forage utilization.

Co-grazing of cattle and goats can maximize forage utilization and reduce weed problem because each species has different forage preferences (Abaye et al., 2008; Coffey, 2001). Cattle prefer to graze grasses while goats select from a wide range of grasses, brush and weeds, and browse. Many weed species found on the pasture grazed by cattle alone can be minimized by introducing goats into the grazing system. Also, quantity of meat produced per unit of pasture may be increased in mixed-species grazing than when either species are grazed alone because of higher forage utilization, reduction in weed problem, and minimization of the gastrointestinal parasitic problem.

4. Rotate Pasture and Hay Field, Crop Field and Pasture

Pastureland can be tilled and used for crop production while crop field can be developed into pasture. All these conversion and tilling operation kill parasite eggs and larvae thereby greatly lowering the parasite burden. But one has to consider economics and practical aspects of all these conversions. Also, if there are different portions of land for hay production and grazing; one can reverse the land use pattern to minimize the parasite concentration. At the reasonable growth of forages after the first hay cutting, goats can be transferred to hay plots, and forages in conventional grazing plots can be allowed to grow for hay cutting. Switch between the hay and grazing plots can be done twice or thrice in a grazing season.

5. Isolate and Treat Areas where there are Snails

In areas where there is liver fluke problem, it is better to identify and isolate the pasture areas where there are snails. Draining the stagnant water reduces the snail habitat. One can use chemicals to minimize the snail population.

6. Improve Pasture for Better Nutrition

Well-fed goats have better immunity to withstand the parasite infection. While developing a pasture, producers need to consider making the pasture productive throughout or most of the year as much as possible. It can be done by incorporating the combination of warm-season and cool-season forage species (grasses, forbs, and legumes). Inclusion of legumes into the grazing system increases the quality of forages (Karki et al., 2009) and eventually the quality of animal diet. It is because legumes contain higher concentration of nitrogen and lower concentration of fiber than most grass species. Nitrogen content is directly related to protein concentration and fiber content related to forage digestibility. High nitrogen content and low fiber content is desirable for quality forage and animal feed.

7. Do Not Overstock

Overstocking is a three-edged sword as it leads to high parasite load, unsustainable pasture because of damages to pasture plants and soil deterioration, and poor animal performance. Animal performance remains low when they are overstocked because of high parasite problem, low forage availability, and environmental stress. Stocking rate has to be determined based on

available forage and requirement of grazing animals. Always, it is better to maintain low stocking rate to manage the parasites.

8. Apply Control Grazing when there is Multi-Species Pasture

Under continuous grazing system, animals are left on the whole pasture throughout the grazing season (Karki and Gurung, 2009). Animals select and graze most palatable plants and plant parts first and less palatable later on. When there are multiple species in a pasture, few species may be more palatable than others. So, most palatable species will be grazed repeatedly as long as animals can get them. Also, when goats congregate around the most palatable species, they drop feces there and make these places densely populated with the parasite eggs and larvae. So, goats have higher chance of getting parasite infection as they graze lower than 5 inches stubble of the palatable species. Moreover, overgrazing of the palatable species cause its low availability or extinction in the uncontrolled grazing. Therefore, pasture having multiple species should be managed applying controlled or rotational grazing.

Under control grazing, producers have control over where, when, and how long goats should graze. Control grazing can be practiced by adopting rotational grazing system or some other specialized grazing systems. Different control-grazing systems are briefly discussed below.

- a) Rotational grazing: In this system, whole pasture is divided into two or more subdivisions (paddocks) through appropriate fencing, and animals are allowed to graze one paddock at a time and moved to another paddock in a sequence or rotation based on forage availability.
- b) Specialized grazing:
 - I. Strip grazing: A strip of a pasture is fenced temporarily with a movable fence and animals are allowed to graze the strip for a short time, which may vary from few hours to a day depending on the strip size and forage availability. When the strip is grazed to a desirable level, the fence is moved to allow animals to another fresh strip.
 - II. Creep grazing: Smaller animals are allowed to go (creep) to a certain portion of pasture having higher forage quality through openings in fence that allows smaller animals but prevent larger animals from entering. Creep grazing is practiced to fulfill the nutritional requirements of young growing animals grazing with their mothers and other mature animals. Creep grazing can be practiced to protect young kids from infection.

- III. Forward creep: Kids are allowed to creep through a creep gate to a fresh pasture first, and then does are allowed to graze the same paddock.
- IV. Limit grazing: Animals are allowed to graze high quality pasture such as legumes or winter annuals for a limited time, e.g., for few hours everyday. Growing high quality forage on a separate piece of pasture and allowing animals to this piece for few hours everyday is useful to fulfill the nutrient requirement of livestock grazing low-quality pasture. This concept can be applied with the tannin-containing forages as well.
- V. First and last grazer: When there are different classes of livestock in terms of parasite problem, those highly vulnerable to the parasite can be grazed first followed by the less vulnerable species. For example, when there are goats and cattle, goats can be allowed to graze first followed by cattle.

Based on farm situations, producers can adopt one or another control grazing system to better feed their goats and minimize the exposure to parasite larvae.

9. Maintain Soil Health to Minimize Parasite Eggs and Larvae

Healthy soil has abundant beneficial organisms such as earthworms, dung beetles, and nematodes trapping fungi. It has been suggested that earthworms kill parasite eggs and larvae either by ingesting them or taking them far below the ground surface into burrows. Similarly, dung beetles are shown to disperse the feces thereby facilitating it to dry and reducing the moisture content. Also, these beetles either ingest or carry the feces down to their burrows, so minimizes the parasite density in the pasture. Nematode trapping fungi are known to trap soil nematodes including parasite nematode larvae and eat them as their food. Depleted soil environment will be detrimental to these beneficial organisms.

10. Place Waterers and Feeders High enough not to Contaminate with Feces

Since parasite eggs come with feces from the infected goats and contaminate the environment, one should be careful while placing waterers and feeders, either for hay or concentrates, in the pasture. These feeders and waterers should be placed high enough from the ground surface such that water and feeds are not contaminated with the fecal materials. How high these waterers and feeders should be placed depends on the height of the goats. One can try placing waterers and

feeders at different heights and select one that gives the best result. Separate waterers and feeders can be provided to young kids using a creep.

Summary

- Pastures serve as reservoirs and provide suitable environment for the survival and development of internal parasites of goats and other animals.
- Warm and moist pasture environment is very conducive for the survival and development of parasite larvae as well as infection by these larvae to goats.
- Following points should be considered to minimize the internal parasitic problem in goats
 - a. Include condensed-tannin containing forages
 - b. Include browse and tall forages into the grazing system
 - c. Apply mixed-species grazing
 - d. Rotate pasture and hay field, crop field and pasture
 - e. Isolate and treat areas where there are snails
 - f. Improve pasture for better nutrition
 - g. Do not overstock
 - h. Apply control grazing
 - i. Maintain pasture soil health

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