

Bioactive forages to control roundworms in sheep

By Dr. Silvina Fernández

Research conducted the last few years by scientists in New Zealand and a EU research consortium have shown that certain forages could be useful to combat gastrointestinal parasites (GIP), or roundworms, in sheep.

Legume forages such as sulla (*Hedysarium coronarium*), white clover (*Trifolium repens*), red clover (*Trifolium pratense*), lotus or big trefoil (*Lotus pedunculatus*), birdsfoot trefoil (*Lotus corniculatus*), sainfoin (*Onobrychis viciifolia*) and chicory (*Cichorium intybus*) have been studied.

Sulla (*Hedysarum coronarium*)



White clover
(*Trifolium repens*)



Sainfoin
(*Onobrychis viciifolia*)

Lotus or big trefoil
(*L. pedunculatus*)



Birdsfoot trefoil
(*Lotus corniculatus*)



Red clover
(*Trifolium pratense*)

With the exception of chicory, all these forages have a common characteristic, namely they contain moderate to high levels of condensed tannins. Condensed tannins are secondary metabolites of plants connected to the plant defense mechanisms against mammalian herbivores and also phytophagous insects. Chicory, on the other hand, contains only traces of condensed tannins, but it is rich in other secondary metabolites such as phenolic compounds, which are believed to have a similar action to that of condensed tannins.



Chicory (*Cichorium intybus*)

Over eight weeks, a UK study assessed 5-month old lambs with naturally-acquired round worm infections. They grazed legumes (lucerne, red clover, or white clover) or grass (ryegrass). Lambs grazing clovers – but not lucerne, had higher liveweight gains, higher final weights and lower fecal parasite egg counts than lambs on ryegrass. Other studies have also shown similar beneficial results; sheep grazing condensed tannin-rich forages had reduced parasite egg excretion and decreased parasite burdens.

Some results have varied depending on the parasite species involved or the source of condensed tannins. For example, some forages such as sainfoin negatively affected parasite species living in the small intestine of sheep but not those in the stomach. Other forages such as clovers, sulla and chicory had the opposite effect by decreasing parasite numbers in sheep stomachs but not in their small intestines.

Excess intake of condensed tannins could have harmful effects. Researchers in New Zealand have found that while moderate levels of condensed tannins have a positive effect on sheep production of milk and wool, high concentrations can reduce productivity and carcass yield.

It is not clear what the mechanisms are for condensed tannins to act against roundworms. There are three possibilities.

1) Condensed tannins may have a direct detrimental effect on the parasites, thus reducing their survival, growth and/or fecundity in the animal gut.

2) Condensed tannins could have a nutritional impact through indirect effects on the absorption of nutrients. Condensed tannins bind to feed proteins in the rumen. Therefore, the feed proteins avoid being degraded in the rumen, increasing their flow to the small intestine where they are finally absorbed. This effect is similar to protein supplementation and could result in improved animal immunity to parasites.

3) The forages containing condensed tannins may provide an unsuitable environment for the survival of parasite larvae on pasture. Therefore, the risk of parasite infection in grazing animals would be reduced.

It is also possible that the mechanisms involved are different for each forage legume.

In conclusion, legume forages rich in condensed tannins could contribute to the control of roundworms when used strategically in grazing management.

There are, however, important considerations to be kept in mind.

1) Parasite issues - Different plant metabolites seem to affect each parasite species in a different way. Mixed infections in the stomachs and small intestines of sheep are the rule on livestock farms. Monospecific infections - those caused by only one roundworm species – are only seen in experimental cases.

2) Physiological issues - Most plant metabolites – and condensed tannins are metabolites – have deleterious properties if consumed excessively. Therefore, it is imperative to know the threshold between the positive effects of forages with condensed tannins and the potential negative consequences on animal metabolism and, consequently, animal production.

3) Geographical issues - Different climatic regions will govern the choices of legume species or varieties to be used under local environmental conditions. There could also be differences in levels of condensed tannins in plants adapted to diverse climatic areas.

All these considerations pose important questions that need to be answered with further research on the issues of condensed tannins to control roundworms in small ruminants. In affiliation with OACC and in collaboration with the Ontario Veterinary College, the Atlantic Veterinary College and colleagues in several provincial governments, I am continuing to look for solutions for organic farmers and for conventional farmers who want to reduce reliance on anthelmintics.

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