

Use of tannin containing browse tree/shrubs in the control of intestinal parasites (helminthes) in small ruminants: review

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Abstract

The overall aim of this review was to evaluate the antihelminthics activity of browse forages containing secondary plant factors. Results from literature have shown the benefits of feeding browse foliage in terms of nutrient supply, supplementation supported animal growth and performance. It was found that supplementation with browse leaf meal reduced worm fecundity, also reduces the worm burdens and total fecal egg counts during feeding period. It is concluded that browse foliage can be used to reduce the adverse effects of intestinal parasite infections in ruminant, hence reducing the need for costly antihelminthics drugs and the development of resistance to these drugs.

Keywords: Antihelminthics, browse foliage, intestinal parasite, tannins

Introduction

The importance of small ruminants in the tropics in general is well recognized (Williamson and Payne, 1978). It is important to note that livestock contributes significantly to improve livelihood, through conversion of natural vegetation and crop residues into animal protein and manure. Their product is easily and quickly sold and thus serves as monetary reserve for rural farmers. They can be owned by rural households and then can have a significant contribution to income generation and food security in a large scale in developing countries.

Njoya *et al.* (2005) indicated that despite the important economic, traditional, social and religious role of small ruminants, their productivity is seriously hampered by high mortalities due to mixed infections by 'peste des petits ruminants' and gastro-intestinal helminthoses and also by poor feeding and management. The number of diseases in small ruminants and the lack of appropriate

feeds lead to low productivity characterised by high mortality and loss of weight (Bourzat, 1980).

Parasites were considered to be a major health hazard for goats particularly in hilly and swampy regions (Battacharya, 1989). Endoparasites were also considered to be a major constraint to goat improvement (Shavulimo, 1989). Parasites in the abomasum and small intestine causes extensive protein losses in the digestive tract of sheep (Kimambo *et al.*, 1998). The impairment of production due to parasite infection, as a result of inefficient food utilization, has been explained (Sykes, 1994; Roy *et al.*, 2003).

The need for alternative means of parasite control is urgent, because of the serious problems associated with parasites, the availability of sub-standard anthelmintics, and sometimes also because of high levels of anthelmintic resistance (Chandrawathani *et al.*, 2004; Hood, 2004). The control of gastro intestinal parasites is becoming more difficult due to the increased resistance of parasites to common

anthelmintics dewormers, commonly available in the markets, has been reported in goats, sheep, and cattle (Prichard, 1994; Pomroy *et al.*, 2002). Alternative parasite management strategies using forages containing condensed tannins have recently been suggested (Niezen *et al.*, 1995; Barry *et al.*, 2001; Min *et al.*, 2002).

The use of foliage from trees and shrubs in ruminant animal nutrition has been focused by many researchers, due to the fact that these feed resources are locally available, perennial sources of feeds (Leng, 1997), rich in protein and particularly appropriate for small ruminants (Seng Sokerya and Rodriguez, 2001).

This review article therefore is based on feeding of browse plants containing tannins on the intestinal parasites in small ruminant animal by small holder farmers, as a control measure.

Importance of browse tree/shrub in ruminant animal nutrition

The potential of leaf meals from tropical trees and shrubs as feed is its ability to yield relatively higher levels of crude protein and minerals and lower crude fiber levels than tropical grasses is well recognized (D'Mello, 1992). Leaves from browse and fodder trees form a major part of livestock feed in tropical countries, (Mandal, 1997) and play an especially important role in improving dietary protein (Aregheore *et al.*, 1998; Kaitho *et al.*, 1998) as a supplementary feed.

ILCA studies in Nigeria established that the use of *Leucaena* and *Gliricidia* as supplementary feeds significantly increased the growth and survival rates of lamb. Statistical analyses of the data showed that each 100g of browse DM consumed per day raises the productivity index by 1.41kg lamb weaned/dam/year (Atta-Krah and Reynolds, 1989). Muinga *et*

al. (1992) established that considerable increases in milk yield can occur in dairy cows fed on Napier grass (bana grass) when supplemented with *Leucaena leucocephala* leaf meal.

Nutritional implication of Condensed Tannins

Condensed tannins (CT) can complex with numerous types of molecules including proteins, polysaccharides, nucleic acids, and minerals (Haslem, 1989). Formation of the CT-protein complex is influenced by many factors, such as pH, composition, and molecular weight of both the tannin and the proteins (Asquith and Butter, 1986).

High CT concentrations such as those in *L. pedunculatus* (63 to 106g of CT/kg of DM) substantially depressed feed intake, digestibility, and animal production in sheep (Barry and Duncan, 1984; Waghorn *et al.*, 1994).

Moderate levels of CT (20 to 40 g of CT/kg of DM) bind to protein by hydrogen bonding at near neutral pH (pH 6.0 to 7.0) in the rumen to form CT-protein complexes, but dissociate and release bound protein at pH less than 3.5 in the abomasum (Barry *et al.*, 2001). Thus, CT-containing plants can protect dietary protein against degradation in the rumen and increase amino acid supply to the abomasum and small intestine, resulting in a improved nutritional status of the animal. At similar CT concentrations (0.25 to 1.75 mg of CT/mg of total soluble plant protein), *Lotus pedunculatus* CT was more effective at protecting the plant protein from degradation by rumen microorganisms than *Lotus corniculatus* CT (Aerts *et al.*, 1999). Therefore, a reduction of protein degradation in the rumen will increase the quantity of protein digested in the small intestine, potentially increasing animal production.

Tannin potential in the control of Intestinal parasites

Condensed tannins may have direct effects on internal parasites themselves or may indirectly control the parasites by increasing the resistance and resilience of animals to gastro intestinal parasites infections through improved protein nutrition. Evidence in support of the direct affect of condensed tannin was provided by Molan *et al.* (2000), who demonstrated that the condensed tannin extracted from *L. pedunculatus*, *L. corniculatus*, *H. coronarium*, and *O. viciifolia* forages reduced the rate of larval development by 91%, reduced the number of eggs hatching by 34%, and decreased the mobility of larvae by 30%.

Min *et al.* (2002b) showed a 57% reduction in FEC and a 61% reduction in total fecal egg output in goats that consumed forage *L. cuneata* (66×104 eggs/d) compared with control forage (168×104 eggs/d). These results suggest that forage containing 5% extractable CT may substantially reduce the contamination of pastures with infective larvae and result in reduced need for anthelmintic drenches.

Molan *et al.* (2000; 2002) have shown that CT extracted from several forages can disrupt the life cycle of nematodes by preventing their eggs from hatching and by preventing larval development to the infective stages.

Fecal egg count and parasite burdens at slaughter were considerably lower for lambs grazing *H. coronarium* (CT-containing forage) than for lambs grazing *M. sativa* (Niezen *et al.*, 1995; 1998a, b). Dewormed lambs grew at similar rates when grazing *H. coronarium* or *M. sativa*. However, nondewormed lambs grew much better on the *H. coronarium*, indicating a reduced need for anthelmintic drugs to control intestinal parasite in grazing lambs.

Also Niezen *et al.* (1995) that direct effects of condensed tannin on intestinal parasites may account for reduced fecal egg counts and nematode burdens in lambs that grazed *Hedysarum coronarium* compared to *M. sativa* in New Zealand.

Lin *et al.* (2003) also found a possible antiparasitic effect of cassava in naturally infected goats. When they offered foliage including cassava *ad libitum* for five months, FEC were lower than in goats fed grass in addition to rice bran and a molasses urea block only. Furthermore, when Dung *et al.* (2005) replaced concentrate with cassava hay at rates from 250 to 1000 g/kg DM, in a diet that contained guinea grass and dried cassava tuber slices, fecal egg count of naturally infected goats were gradually reduced with the increasing levels of cassava hay.

Conclusion

Apart from providing feed resource for the ruminant livestock, condensed tannin-containing forages have the potential to help control anthelmintic-resistant gastrointestinal parasites at various stages of their development. This reduces pasture contamination and ingestion of infective larvae and by itself might provide adequate control of gastrointestinal parasites. Also the use of tannin rich browse plants reduces cost of intestinal parasite control and the problems of drug resistance and improvement in the performance of ruminant animals.

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