

# Sainfoin, a natural anthelmintic for small ruminants?

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## About

Nematodes of the gastro intestinal tract are of major economic importance in livestock, particularly in domestic ruminants. This technical note provides an overview of the state of knowledge on sainfoin, a tannin containing legume forage, that may play a relevant role in non-chemical control of nematodes of the gastro intestinal tract.



## Introduction

The extensive employment of synthetic chemical anthelmintics against nematodes of the gastro intestinal tract has resulted in a widespread development of resistance to these products in domestic ruminants. Therefore, it is crucial to seek alternative or complementary solutions to controlling these parasites.

Several controlled or systemic studies within the LowInputBreeds project aimed at providing additional information on the pertinent use of sainfoin, as a model of tannin-containing legume, in an integrated control of gastro intestinal nematodes.

## Natural control of nematodes of the gastro intestinal tract

One of the novel approaches to control nematodes of the gastro intestinal tract is the use of tannin containing legume forages. Many studies illustrate their potential value as “nutraceuticals” – a term contracting the words “nutrition” and “pharmaceutical”. It has been defined as “*Any substance that may be considered a food or part of a food which provides health benefits, including the prevention and treatment of disease*” (Andlauer and Furst, 2002).

Several legume forages containing condensed tannins (CTs) correspond to this definition of “nutraceutical” for domestic ruminants. Sainfoin (*Onobrychis viciifolia* Scop.) (see picture above) is a nutraceutical model of CT-containing legumes, which has received much attention in Europe.

Repeated results have shown the potential activities against nematodes of the gastro intestinal tract, when sheep or goats are fed on sainfoin (Paolini et al, 2003, 2005; Heckendorn et al., 2006, 2012; Manolaraki et al., 2010; Werne et al., 2012, 2013).

## Anthelmintic effects of sainfoin

Feeding sainfoin to sheep and goats had the following anthelmintic effects (see figure 1):

- Reduced excretion of nematodes of the gastro intestinal tract
- Reduced establishment of infective larvae in the sheep or goats
- Possible delay/reduction in egg development

The effects due to the natural condensed tannins and flavonoids differ by many ways from the chemical anthelmintics. Their main action does not consist in eliminating the worms, but rather in modulating different biological traits of the nematodes of the gastro intestinal tract's life cycle.

It is important, however, to underline that sainfoin is not comparable to any standardised commercial drug. As for any plant, its composition is highly variable. This explains why the expected anthelmintic activity of sainfoin can sometimes be disappointing.

The potential active compounds of sainfoin are not yet all known, as is the mechanism of interaction with the different worm species and stages, which represents a major direction in research on sainfoin currently in Europe.

Another health effect on ruminants consuming sainfoin has for long been identified, i.e. the prevention of bloating (in contrast with clover). This positive effect has been associated with the presence of condensed tannins and probably explains, why the literal translation of the French word "Sainfoin" means "Healthy Hay".



Sainfoin is a highly palatable legume for small ruminants. Photo: Felix Heckendorn

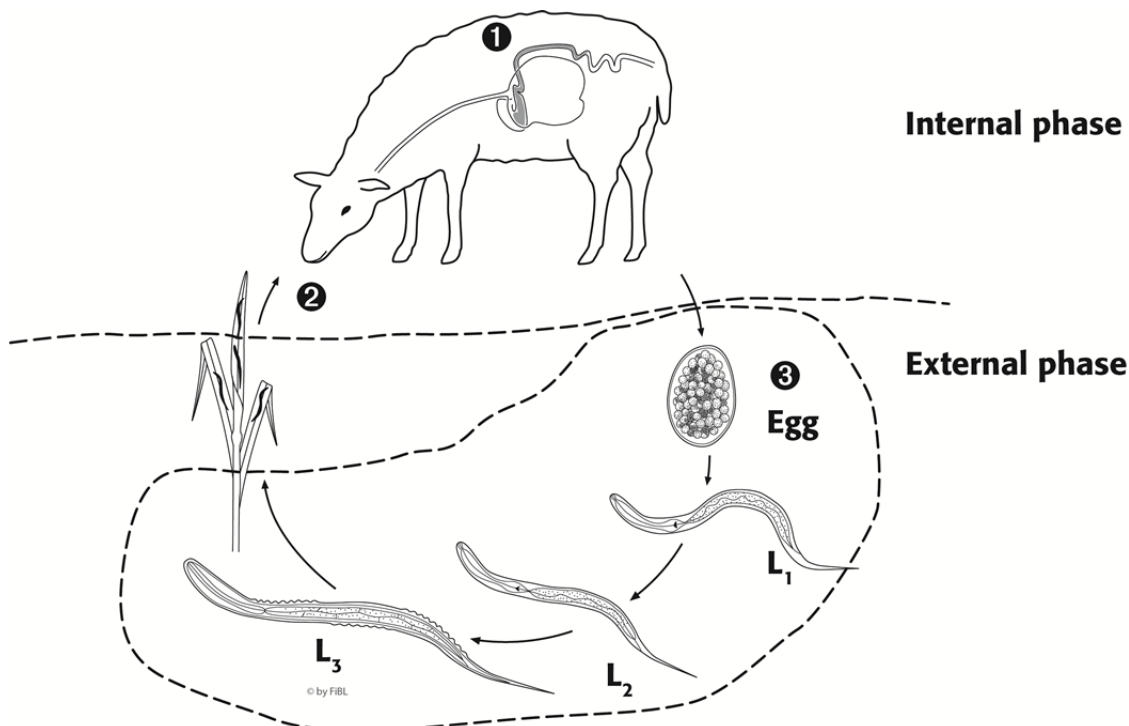


Figure 1: The life cycle of gastro intestinal nematodes in small ruminants: The consumption of sainfoin and/or other tannin containing legumes has been associated with three potential impacts: i) on the adult worm populations and the egg excretion; ii) on the success of establishment of the infective larvae (L<sub>3</sub>) and iii) on the development of eggs to infective larvae.

## Additional benefits of sainfoin

Like several other tannin containing forages, sainfoin also has other advantages besides being a “nutraceutical”.

- It is a rustic plant, well adapted to drought conditions.
- As a legume, sainfoin fixes nitrogen and can be considered as a natural fertilizer.
- Some results suggest that compared to lucerne, a legume without tannins, consumption of sainfoin promotes nitrogen excretion in feces rather than urine, providing better nitrogen retention from manure for soil fertility management.
- Sainfoin is highly palatable for ruminants.
- Several studies suggest that consumption of sainfoin reduces methane emission from the rumen, therefore reducing the potential Green House Gases. The tannins seem to be the reason for the anti-bloating properties of sainfoin.
- Sainfoin is attractive for bees and other pollinators.



Sainfoin is an attractive feed for bees. Photo: Smaragda Sotiraki

## Weaknesses of sainfoin

There are also some difficulties in sainfoin breeding, which explain why this legume only recently has been rediscovered.

- Sainfoin is well adapted to soil with high pH (limy), but is more difficult to grow in acidic conditions.
- Sainfoin only achieves half or one third of the yield of lucerne and will persist for a maximum of 3 years.
- Since the 1950s, sainfoin has been neglected compared to lucerne. It has not benefited of a programme of selection or characterisation of varieties. It has remained as an *anecdotal plant* for nearly 50 years and this delay must now be repaired.
- Sainfoin is a natural product and hence highly variable. A pertinent use of its properties requires a better understanding of the underlying mechanisms of action. Research on these issues is far from being completed.



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### Title photo

Flowering sainfoin plant. Feeding of the legume to sheep and goats has contributed to the control of nematodes of the gastro intestinal tract. Picture: Smaragda Sotiraki Hellenic Agricultural Organisation, Demeter.

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