TECHNICAL NOTE

LowInputBreeds

Alternative control of gastro intestinal nematodes in low-input sheep and goat production

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About

This technical note summarizes results and recommendations from the LowInputBreeds project for controlling gastro intestinal nematodes (GIN). These include: eliminating the worm populations in the host, disturbing the life-cycle of worm populations, improving the hosts' response against the worms and reducing contact between vulnerable hosts and infective nematodes.

Introduction

Nematodes of the gastro intestinal tract (GINs) of sheep and goats are of major economic importance because they lead to production losses via reduced growth and carcass weight and/or milk production. In addition, when remaining uncontrolled, these parasitic worms can also provoke severe clinical signs (anemia, diarrhoea) or even mortalities.

For over 50 years, synthetic chemical anthelmintics (AHs) from the pharmaceutical industry have been extensively used to eliminate the worms in the hosts and thus, control this parasitic disease and reduce the induced production losses.

However, this quasi-exclusive reliance on chemical molecules is currently challenged for two main reasons:

- An increasing demand of European consumers for products from low-input production, which aims at limiting the general use of synthetic chemicals in the farm industry to reduce possible residues in food and/or environmental consequences.
- The worldwide development and diffusion of resistance to synthetic chemical anthelmintics in worm populations, which progressively lowers the efficiency of these synthetic molecules.

This is why there are severe limitations on the use of chemical AH recommended by regulations in organic farming and generally a strong impetus to explore alternative or complementary solutions to the use of commercial AHs.

As illustrated by figure 1, these solutions refer to 3 main principles:

A. To eliminate worm populations in the host by more rational use of chemical substances and to disturb the biology of worm populations by using natural substances.

B. To improve the hosts' response against the worms.

C. To reduce the contact between the nematode infective stages (larvae, L_{1-3}) on pastures and vulnerable hosts.

Hoste et al. (2014): Alternative control of gastro intestinal nematodes in low-input sheep and goat production. LowInputBreeds technical note. Download at www.lowinputbreeds.org

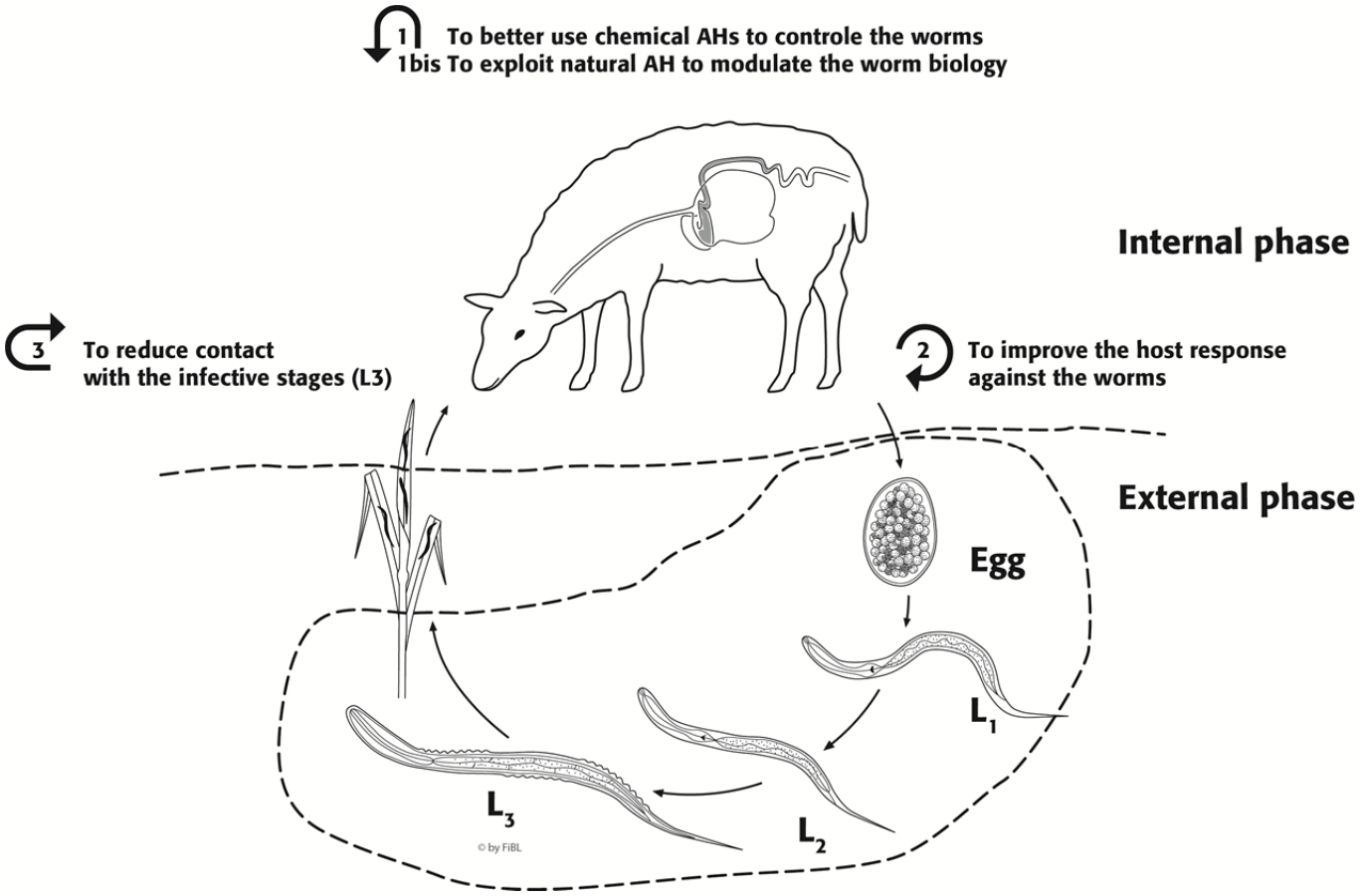

Figure 1: Control of Gastrointestinal nematodes (GIN)

To disturb the biology of worm populations by using natural substances

This corresponds to the concept of nutraceuticals. In the case of nematodes of the gastro intestinal tract (GINs), possible nutraceuticals are tannin-containing legume forages, like sainfoin or big or birdfoot tre-foils. Many studies have also been dedicated to the possible exploitation of chicory.

Another specific technical note is dedicated to this approach within the LowInputBreeds project. [1].

To improve the host response against the worms

Means to stimulate the host´s ability to endure the infection with GIN or to improve their immune response against the worms potentially include:

Vaccination

There have been numerous attempts to develop vaccine against the GINs and this remains the focus of much research throughout the world. However, and unfortunately, no commercial vaccines against GINs are currently available.

Genetic selection

Not all animals are affected equally when challenged with GINs. Differences between individual sheep or goats in the level infection and/or in the severity of pathological consequences have long been identified. This observation has probably led to some 'common sense'-selection by farmers for centuries to eliminate more susceptible animals. On the other hand, since the 1970s, this developed into the search for scientific tools to explore possible genetic selection of ruminants traits for resistance to GIN infections. These tools have been used to compare responses to GINs, either be-

[1] Hoste et al: Sainfoin, a natural anthelmintic for small ruminants? LowInputBreeds Consortium/FiBL, Frick. Available at http://www.lowinputbreeds.org/lib-technical-notes.html

tween breeds (including local, native breeds such as the Greek Sfakiano which was studied in the LowInputBreeds project) or between individuals within a breed. Initially, quantitative genetic approaches based on phenotypic markers (mainly faecal egg counts) were used whereas now they aim to identifying molecular markers. This includes two large studies in Greece, Switzerland and New Zealand within the LowInputBreeds project.

Any selection process takes time because of the needs to explore both positive potential but also the possible negative consequences.

Greek Sfakiano sheep (Photo: Nikos Tzanidakis)

Adapting the nutrition to the infected host

"Take care of flock/herd nutrition and the animals will take care of the parasites". The presence of GINs is associated with mild to severe pathophysiological consequences resulting in reduced efficiency in nutrient utilisation by sheep or goats. One way to compensate these troubles is to supplement diets, particularly with protein. However, one of the difficulties in this approach is how to adjust this complementation to cover increased needs.

To reduce the contact between the nematode infective stages on pastures and vulnerable hosts

The source of GIN infections are infective larvae on the pastures. Any means to reduce the contact between these and the animals will contribute to reduce the animals' infection and the associated consequences on production.

Different methods have been described to limit these contacts:

- by diluting the larvae by reducing the effective stocking rate and hence the pasture contamination (extensive grazing);
- by eliminating the larvae on the pastures (eg by use of nematophagous fungi or application of mixed - alternate or simultaneous - grazing systems between cattle and sheep);
- by favouring the natural cleaning of pasture by exploiting the natural death rate of the larvae (use of different rotational systems).

To this respect, the LowInputBreeds project has particularly focused on the interest of transhumance practices for the management of nematode parasitism in flocks.

Imprint

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LowInputBreeds

LowInputBreeds is the acronym of the project 'Development of integrated livestock breeding and management strategies to improve animal health, product quality and performance in European organic and 'low input' milk, meat and egg production'. It is funded under the Seventh Framework Programme of the European Community for Research, Technological Development and Demonstration Activities(Contract No. 222623).

Editorial support

Gillian Butler, Newcastle University, UK

Layout

Helga Willer and Gilles Weidmann, Research Institute of Organic Agriculture (FiBL), Frick, Switzerland

Cover picture

Transhumance in the Swiss Alps. Photo: Felix Heckendorn

Publishers

Consortium of the LowInputBreeds project, c/o Newcastle University, UK, and Research Institute of Organic Agriculture (FiBL), Frick, Switzerland

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