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1. Executive summary

In organic husbandry systems it is aspired that animals should have pasture access throughout the grazing season. This exposure increases the risk of infection with pasture borne parasites such as gastrointestinal nematodes (GIN). Until recently, skilful pasture management and the targeted use of anthelmintics helped to control GIN infestation satisfactorily. However, increasing resistance to all available classes of active substances makes it necessary to use anthelmintics even more sparingly so that they remain effective in the longer term.

There has been increasing interest in the use of bioactive plant feeding as a sustainable gastrointestinal parasite control method for small ruminants. Plants rich in secondary metabolites, such as condensed tannins (CT), have been shown to have anthelmintic properties *in vitro* and *in vivo*. The perennial shrub heather (*Calluna vulgaris*) is highly abundant across European countries and is rich in CTs. Previous studies have shown that heather extracts have anthelmintic effects *in vitro* and *in vivo*.

The nematophagous fungus *Duddingtonia flagrans* is a promising element of a complementary strategy to control GIN in grazing animals. The fungus grows naturally in the soil or in organic matter such as compost and feeds on soil nematodes, which are very similar in size and appearance to the free-living juvenile stages of GIN. Robust chlamydospores of the fungus can pass undigested through the gastrointestinal tract of grazing animals. They then germinate in the freshly deposited faeces, and trap and digest GIN larvae, which develop from eggs in parallel to the growing fungus.

The aim of our study was to investigate possible antagonistic or synergistic effects of heather feeding and *D. flagrans* administration on the development of GIN larvae from the faeces of parasitized sheep.

A feeding experiment was carried out with twelve groups of three lambs each, artificially infected with GIN. Six groups were offered fresh heather and six groups were offered a control feed with a similar nutrient content in addition to hay as a base diet for both groups. After two weeks of heather feeding, the development rate of GIN larvae was determined in quantitative faecal cultures. One animal per group was then assigned to either a normal or a low dose of *D. flagrans* spores or to the untreated control group. After several days of *D. flagrans* administration, the development rate of helminth larvae was again determined in quantitative faecal cultures.

Feeding behaviour observations revealed that all animals consumed heather or control hay. Animals offered heather displayed similar meal frequencies than those offered control hay. Daily average feed intake across all treatments was 1.7 kg of fresh matter. Overall, animals consumed more at the end than at the beginning of the feeding period. Feed intake, daily weight gain and feed conversion ratio did not differ between the heather and the control group.

Overall, there was no significant effect of heather on Faecal Egg Count (FEC) and faecal dry matter (30% in both groups). There was a tendency for a significant interaction between feed type (heather or control feed) and duration of feeding and the *post hoc* test revealed a significantly lower FEC of 22% in the heather group at the end of the heather feeding period compared to the control group.

In both *D. flagrans* treatments, there was no significant difference between larval recovery from faecal cultures of animals fed heather or control feed. As compared to the untreated control group, both doses of *D. flagrans* reduced larval recovery by approximately 95%. There was no difference between the high and the low dose.

In conclusion, our results confirm the potential of and indicate no negative interactions between both alternative GIN control methods.

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2. Dissemination activities related with the Deliverable

2.1 Presentation of the results in a peer-reviewed publication

A manuscript for a scientific peer-reviewed publication was written and submitted to a parasitological Journal on the 5th of August 2021. Once published (gold open access), it will be linked to this deliverable.

2.2 Presentation of the results at scientific conferences

In 2021, selected results were presented as oral contributions at the science track of the organic world conference in Rennes/online and at the Annual Conference of the European Federation of Animal Science (EAAP) in Davos, Switzerland.