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Improvements in nematophagous fungi to control gastro-intestinal parasites

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Abstract

Gastro-intestinal parasites are a major cause of production loss in New Zealand livestock, and the continuing development of anthelmintic-resistant strains represents a significant threat to the future New Zealand agricultural economy. This has led to an increased interest in alternative (non-chemotherapeutic) controls, including potential application of the nematode-trapping fungi *Duddingtonia flagrans* and *Arthrobotrys oligospora*. These species are capable of reducing the number of free-living stages of trichostrongylid nematodes developing in faeces, following oral administration or the addition of fungal material to faeces. However, high spore mortality through the gastro-intestinal tract currently limits the development of a commercial product, even for the robust chlamydospores of *D. flagrans*. The potential to reduce spore mortality by applying a protective coating to the spores was investigated, and an *in vitro* rumen simulation bioassay was used to quantitatively evaluate and compare the survival of *D. flagrans* and *A. oligospora* spores in a series of experiments. These experiments revealed that unprotected *D. flagrans* chlamydospores were superior to *A. oligospora* conidia in their ability to withstand the debilitating effects of rumen fluid. However, the survival of *A. oligospora* was improved by integration into a biopolymer formulation. Dried *D. flagrans* chlamydospores were more resistant to a simulated rumen environment than freshly harvested chlamydospores, and exposure to water as an incubation medium was less detrimental than rumen fluid to the survival of both fresh and dried *D. flagrans* chlamydospores. The application of a stearic acid coating to dried *D. flagrans* chlamydospores failed to improve spore survival in either a simulated rumen environment, or efficacy during subsequent *in vivo* testing. However, as the application of a biopolymer formulation successfully improved the survival of *A. oligospora* conidia, it is likely that similar formulations may be successfully applied to other fungal species. These results highlight the potential for development of formulations containing multiple species of nematophagous fungi, including the application of fungal species that were previously unsuitable due to very high spore mortality.

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"Horses know nothing of money, status, beauty or accomplishment.....

Horses see only our hearts, and they accept us or reject us on what they find within.....

In short, horses do naturally what humans can pass a lifetime without ever mastering."

Author Mary Midkiff quoted in *The Denver Post*

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