



APPLICATION SUMMARY

Application organisms	<i>Neotyphodium siegelii</i>
Purpose	To release of <i>Neotyphodium siegelii</i> as a beneficial grass endophyte
Application number	APP201519
Application type	Notified, Non-GM release, Full Release
Applicant	DLF Seeds Limited
Date formally received	

Application summary prepared by DLF Seeds Limited

This application seeks to import and release *Neotyphodium siegelii*, an endophytic fungus that is safe to animals and the environment, and contributes to ryegrass and fescue persistence by protecting the plants from invertebrate pests and drought.

Endophytes are fungi that exist in a normal symbiotic relationship with grass plants. They grow between plant cells and function as if they were a part of the plant. Most ryegrass and fescue pastures in New Zealand contain endophytes. These include *Neotyphodium lolii*, *Neotyphodium uncinatum* and *Neotyphodium coenophialum* that exist within perennial ryegrass, meadow fescue, and tall fescue, respectively. In association with the grass, these endophytes produce a wide range of bio-active alkaloid compounds, including peramine, ergovaline, lolitrem B and lolines. All four of these compounds deter insect pests, and protect the plant against Argentinean stem weevil, black beetle, root aphid, porina and mealy bug. However, at high concentrations ergovaline and lolitrem B are toxic to cattle and sheep, respectively, causing a neurological disorder known as Ryegrass staggers. Ryegrass toxicity and other livestock illness caused by some endophyte-grass associations presents a significant problem to New Zealand's agricultural industry.

Some endophytes found in tall and meadow fescues, such as *N. uncinatum*, produce only loline alkaloids. Loline alkaloids are non-toxic and completely safe for animals, but still have the capacity to deter insect feeding. Grass-endophyte associations that produce only loline alkaloids present all the benefits of endophyte association to the grass species, such as protection from insect pests, but are non-toxic and completely safe for grazing animals.

In 2001 a scientific paper described a previously unknown endophyte species in meadow fescue which was named *Neotyphodium siegelii*. *Neotyphodium. siegelii* behaves in the same way as *N. uncinatum* and produces only the non-toxic alkaloid, loline. We are applying to introduce the *N. siegelii* endophyte for use in grass pastures to improve forage and animal production, pasture persistence and tolerance to drought and reduce pesticide use.

Neotyphodium siegelii is asexual and does not produce spores. It cannot spread from one plant to another, and cannot change as sexual recombination does not occur. *Neotyphodium* endophytes exist in a normal symbiotic relationship with the grass plant, and function as if they were a plant tissue. In nature, they are transmitted solely within the seeds produced by the host grass, and growth of the endophyte is synchronized with the host plant tissues. When the leaf tissues hosting the endophyte senesce and die, the endophyte dies too.

Neotyphodium siegelii is only known to associate with meadow fescue. It cannot be transmitted to other plant species, and is not known to colonise any native New Zealand plant species, fruit or vegetable crops, forestry species, or any other plant. *Neotyphodium siegelii* does not present any risk to beneficial invertebrates such as earthworms, or to animals, humans, or the environment. It may cause reduced weight and reproductive performance in grass grub (*Costelytra zealandica*), an invertebrate pest native to New Zealand. However, tests have shown no significant effect on mortality of grass grub, and agrichemicals are currently widely used to control grass grub on arable land.

New Zealand is the world leader when it comes to the production and acceptance of cultivars of perennial ryegrass and tall fescue associated with *Neotyphodium* endophytes to enhance pastoral – based agricultural productivity. New endophyte strains contribute at least \$200 million each year to the New Zealand economy, and this development is regarded as a major success of New Zealand research. We believe *N. siegelii* has the potential to provide significant economic benefits for the New Zealand farmer. Immediate benefits will accrue from reduced pasture damage from insects, reduced re-sowing costs, greater drought resistance, improved animal health, higher meat, milk, and wool production, and less expenditure on pesticide application. Since other ‘safe’ grass endophytes were introduced into NZ in the early 1990’s they have only been perceived as beneficial to the economy and to the environment.