



DECISION

Amended under section 67A of the HSNO Act on 19 August 2014

Date	27 June 2013
Application code	APP201519
Application type	To release any new organism under section 34 of the Hazardous Substances and New Organisms Act 1996
Applicant	DLF Seeds Ltd
Date application received	22 February 2013
Hearing and consideration	14 June 2013
Considered by	A decision-making committee of the Environmental Protection Authority (the Committee) ¹ ; <ul style="list-style-type: none">• Dr Shaun Ogilvie (Chair)• Dr Louise Malone• Dr Deborah Read
Purpose of the application	To import and release <i>Neotyphodium siegelii</i> , an endophytic fungus that is safe to animals and the environment, and contributes to ryegrass and fescue persistence, protecting the plants from invertebrate pests and drought
The new organism approved for release	<i>Neotyphodium siegelii</i>

1. Summary of decision

- 1.1. The application to release *Neotyphodium siegelii* was lodged under section 34 of the Hazardous Substances and New Organisms Act 1996 (the Act).
- 1.2. The application was considered in accordance with the relevant provisions of the Act and of the HSNO (Methodology) Order 1998 (the Methodology).
- 1.3. The Committee has **approved** the application **without controls** in accordance with section 38(1)(a) of the Act.

¹ The Committee referred to in this decision is the subcommittee that has made the decision on this application under delegated authority in accordance with section 18A of the Act.

2. Application process

Application Receipt

2.1. The application was formally received for processing on 22 February 2013.

Public notification

- 2.2. Section 53(1)(c) of the Act provides that an application under section 34 of the Act must be publicly notified by the Environmental Protection Authority (EPA).
- 2.3. The application was notified by placing a notice on the EPA website on 7 March 2013.
- 2.4. In accordance with section 53(4) of the Act, letters or emails notifying the Minister for the Environment, the Ministry for Primary Industries (MPI), the Department of Conservation (DOC), and other government departments, crown entities, and local authorities who have expressed an interest in being notified about applications for non-genetically modified new organisms were sent. Māori organisations, non-government organisations and stakeholders who have expressed an interest in being notified about applications for non-genetically modified new organisms were directly notified. All those parties had an opportunity to comment on the application as per section 58(1)(c) of the Act and clause 5 of the Methodology.
- 2.5. The Ministry of Primary Industries (MPI) chose not to comment on the application.
- 2.6. The Department of Conservation (DOC) expressed concerns about the effect that *Neotyphodium siegelii* may have on endemic insect species, and asked whether ryegrass may displace other native plant species due to increased host fitness. DOC acknowledged that they do not have the specific scientific expertise to comment fully on the application, and recommended that EPA staff consult with independent, qualified experts.
- 2.7. Section 59(1)(c) of the Act requires an application to be open for the receipt of submissions for 30 working days from the date of public notification. The application was open for submissions from 7 March 2013 until 22 April 2013.
- 2.8. Six submissions were received through the public notification pathway. Grasslanz Technology Ltd, the New Zealand Plant Breeding and Research Association, Beef + Lamb New Zealand Ltd, Federated Farmers of New Zealand Inc., and Dairy New Zealand made submissions in support of the application, and Bevan Weir made a submission that neither supported nor opposed the application. Grasslanz Technology Ltd and the New Zealand Plant Breeding and Research Association (NZPBRA) requested to speak at the hearing.



Reports sought

- 2.9. The EPA staff report was provided under section 58(1)(a) of the Act.
- 2.10. Ngā Kaihautū Tikanga Taiao (NKTT) were given the opportunity to prepare a report and chose not to comment on the application. They considered that *Neotyphodium siegelii* does not pose a significant risk because it produces only loline which does not affect animals; the endophyte is asexual and does not produce spores; and the whakapapa of this endophyte has been present in New Zealand for some time. They considered that no further comment was needed.
- 2.11. On 30 May 2013, the EPA staff report was published on the EPA website and the applicant and submitters were informed of its availability.

Hearing and Consideration

- 2.12. Section 59(1)(d) of the Act requires that the hearing commence not more than 30 working days after the closing date for submissions. The hearing was originally scheduled for 30 May 2013 in Wellington but the applicant was unable to attend, and requested a change of date. After consultation with all submitters intending to speak at the hearing, the hearing was postponed until 14 June 2013. As this revised hearing date is outside the 30 working day period, the 59(1)(d) time requirement was waived under section 59(5).
- 2.13. Tom Bruynel from DLF Seeds presented the application (in person) and introduced Dr Pedro Evans as an expert witness appearing on behalf of the applicant.
- 2.14. Submitters Thomas Chin, and Michael Norris on behalf of the New Zealand Plant Breeding and Research Association, and John Caradus on behalf of Grasslanz Technology presented their submissions in person. Specific points raised by submitters (either in their submission or during the hearing) are addressed where appropriate throughout this decision document.
- 2.15. The Committee would like to thank all people who submitted the information used in making this decision. Public submissions provide a focus for the Committee on points that need clarification, and the Committee found the submissions and the applicant's responses very helpful in its consideration of the application.

Information available for the consideration

- 2.16. The information available for the consideration comprised:
- The application;
 - EPA staff advice report including advice from the Principal Scientist;
 - Comments received from DOC;
 - Submissions; and
 - Information obtained during the hearing.



Legislative criteria for application

2.17. The application was determined in accordance with section 38 of the Act, taking into account the matters specified in sections 36 and 37, relevant matters in Part 2 of the Act, and the Methodology.

3. Minimum Standards

- 3.1. The Committee noted that the biology of *Neotyphodium siegelii* is described in the application and the EPA staff report. They were comfortable that this had been well covered in the staff report, and through the submissions.
- 3.2. The Committee considered whether *Neotyphodium siegelii* meets the five minimum standards as specified in section 36(a-e) of the Act, specifically whether it could:
- (a) cause any significant displacement of any native species within its natural habitat; or
 - (b) cause any significant deterioration of natural habitats; or
 - (c) cause any significant adverse effects on human health and safety; or
 - (d) cause any significant adverse effects to New Zealand's inherent genetic diversity; or
 - (e) cause disease, be parasitic, or become a vector for human, animal, or plant disease, unless the purpose is to import or release an organism to cause disease, be a parasite, or a vector for disease.

Consideration of section 36(a) of the Act

- 3.3. The Committee considered whether *Neotyphodium siegelii* is likely to cause any significant displacement of any native species within its natural habitat.
- 3.4. The applicant and submitters provided evidence that *Neotyphodium siegelii* is an asexual endophyte thought to have originated from the hybridization of two sexual endophyte species. *Neotyphodium siegelii* is spread only by vertical transmission, and can only pass between plants by colonization of seeds produced by the host.
- 3.5. The Committee noted that while *Neotyphodium siegelii* has been shown experimentally to produce asexual conidia *in vitro* and *in planta*, it has never been demonstrated that *Neotyphodium siegelii* can spread to uninfected plants via these conidia.
- 3.6. One submitter, Bevan Weir, was concerned that *Neotyphodium siegelii* could hybridise with native *Neotyphodium* species, and could spread into native grasses.
- 3.7. The Committee noted comments from Professor Dr Adrian Leuchtman provided in the EPA Staff Advice Report that there is no information to suggest that *Neotyphodium siegelii* can hybridize with other endophytes. Hybridization requires co-infection of a host plant by two endophytes, fusion of the



fungal somatic cells, and survival of the resulting strain, which is considered to be an extremely rare event.

- 3.8. The Committee also recognized that the only known grass endophyte native to New Zealand is *Neotyphodium aotearoae*, which colonises only Hedgehog grass (*Echinopogon ovatus*), and does not colonise pasture grasses. Since *Neotyphodium siegelii* does not colonise Hedgehog grass and cannot be passed between plants, and since *Neotyphodium aotearoae* does not colonise perennial ryegrass, tall fescue, or meadow fescue, the Committee considered it extremely unlikely that these endophyte species would hybridise.
- 3.9. Therefore, the Committee considered it extremely unlikely that *Neotyphodium siegelii* could displace *Neotyphodium aotearoae*, or any other fungus, from its natural habitat. The Committee is therefore satisfied that no native fungi will be displaced through the release of *Neotyphodium siegelii*.
- 3.10. After assessing all the information, the Committee is satisfied that *Neotyphodium siegelii* is not likely to cause any significant displacement of any native species within its natural habitat.

Consideration of section 36(b) of the Act

- 3.11. The Committee considered whether *Neotyphodium siegelii* is likely to cause any significant deterioration of natural habitats.
- 3.12. The Committee acknowledged risks raised by DOC in their submission that the improved pest resistance and drought tolerance conferred on perennial ryegrass or meadow fescue by *Neotyphodium siegelii* may make these grasses more invasive, and cause them to expand their natural host range.
- 3.13. The applicant noted during the hearing that many of the *Neotyphodium* endophytes that are currently in New Zealand, including *N. coenophialum*, and *N. lolii* produce alkaloids that are toxic to both invertebrates and vertebrate macro herbivores, such as sheep, cattle, and rabbits. The applicant explained that since *Neotyphodium siegelii* produces only the non-toxic loline alkaloids, grasses containing *Neotyphodium siegelii* would be more palatable to grazing animals, and therefore under more intense grazing pressure.
- 3.14. The Committee also noted comments in the EPA Staff Advice Report made by Professor Dr Adrian Leuchtman that the benefits conferred by endophytes are moderate, and it is unlikely that endophytes will turn grasses into invasive species.
- 3.15. The Committee considered that the host-fitness advantages conferred by the toxic *N. lolii* and *N. coenophialum* endophytes are more likely to cause pasture grasses to be more invasive than grasses associated with *Neotyphodium siegelii*. They acknowledged that these grass-endophyte



associations are already present in New Zealand, and are not considered invasive. They also noted that pasture grasses require a high degree of nurturing and cultivation to maintain performance.

- 3.16. Therefore, the Committee considers it very unlikely that association with *Neotyphodium siegelii* will cause any pasture grass to become more invasive.
- 3.17. After assessing all the information, the Committee is satisfied that *Neotyphodium siegelii* is not likely to cause any significant deterioration of natural habitats.

Consideration of section 36(c) of the Act

- 3.18. The Committee considered whether *Neotyphodium siegelii* is likely to cause any significant adverse effects on human health and safety.
- 3.19. The applicant, submitters, and the EPA staff report did not identify any examples of *Neotyphodium siegelii* acting as a human pathogen or posing a threat of any kind to human health and safety. After assessing all the information, the Committee did not identify any mechanisms by which this could happen, and is satisfied that *Neotyphodium siegelii* is not likely to cause any significant adverse effects on human health and safety.

Consideration of section 36(d) of the Act

- 3.20. The Committee considered whether *Neotyphodium siegelii* is likely to cause any significant adverse effect on New Zealand's inherent genetic diversity.
- 3.21. The Committee is satisfied with the information on the taxonomy and biological characteristics of *Neotyphodium siegelii* provided in the EPA staff report, and recognized that *Neotyphodium siegelii* is a hybrid of two sexual *Epichloe* endophyte species.
- 3.22. The Committee noted concerns raised by a submitter, Bevan Weir that *Neotyphodium siegelii* could hybridise with a native *Neotyphodium* fungus, but considered this highly unlikely (see above, 3.6-3.10). The Committee noted that the evolutionary changes required for this to occur happen over hundreds and thousands of generations, even under positive selective pressure. This equates to hundreds, or even thousands of years, and cannot be considered as part of the HSNO risk assessment.
- 3.23. After assessing all the information, the Committee is satisfied that *Neotyphodium siegelii* is not likely to cause any significant adverse effects on New Zealand's inherent genetic diversity.

Consideration of section 36(e) of the Act

- 3.24. The Committee considered whether *Neotyphodium siegelii* is likely to cause disease, be parasitic, or become a vector for human, animal, or plant disease.



- 3.25. The applicant noted that *Neotyphodium siegelii* is not a plant pathogen and it is not known to cause disease in animals.
- 3.26. The Committee accepted that there are no examples of *Neotyphodium siegelii* acting as a pathogen, parasite, or vector of human, animal, or plant disease. Therefore, the Committee is satisfied that *Neotyphodium siegelii* is not likely to cause disease, be parasitic, or become a vector for human, animal, or plant disease.

Conclusion on the Minimum Standards

- 3.27. After assessing all the information, the Committee considers that *Neotyphodium siegelii* meets the minimum standards, as specified in section 38(a)(i) of the Act.

4. The ability to establish an undesirable self-sustaining population and the ease of eradication

- 4.1. Section 37 of the Act requires the Committee to have regard to the ability of the organism to establish an undesirable self-sustaining population and the ease with which the organism could be eradicated if it established such a population.
- 4.2. The Committee considered the biological characteristics of *Neotyphodium siegelii* presented by the applicant, submitters and detailed in the EPA staff advice report. The Committee acknowledged that *Neotyphodium siegelii* is a symbiotic fungal endophyte that lives between the cells of its grass host, and that it is incapable of existing as a free-living organism. They also note that the endophyte cannot be passed from plant to plant.
- 4.3. Therefore, the Committee considers that *Neotyphodium siegelii* could not establish a self-sustaining population, but that its hosts, meadow fescue, perennial ryegrass, or tall fescue could establish such a population. However, self-sustaining populations of the grass-fungus association would not be undesirable, as that is the intention of the release.
- 4.4. The Committee noted that the eradication of *Neotyphodium siegelii* would involve the eradication of the endophyte in association with its ryegrass host. They considered that this is potentially very difficult, but could be achieved by preventing supply of seed containing the endophyte, and waiting for the grass to die or be grazed out; through the process of pasture renewal; or through the use of herbicides as a last resort. However, the Committee notes this is unlikely to be an objective.

5. Effects of any inseparable organism

- 5.1. No inseparable organisms associated with *Neotyphodium siegelii* were identified.



6. Assessment of adverse effects

- 6.1. The Committee considered the potential adverse effects of the organism, including any risks and costs associated with the release of the organism, on human health and safety, the environment, society and communities, Māori culture and traditions, the principles of the Treaty of Waitangi (Te Tiriti o Waitangi), and the market economy.
- 6.2. After assessing all the information, the Committee did not identify any significant adverse effects on human health and safety, or on the market economy from the release of *Neotyphodium siegelii*.
- 6.3. The Committee considered whether *Neotyphodium siegelii* could pose any environmental effects in addition to those covered under the minimum standards. They paid particular regard to concerns raised by DOC that *Neotyphodium siegelii* may have an adverse effect on beneficial or non-target invertebrates, such as New Zealand's endemic grass moths (family Crambidae), or on the New Zealand native Grass Grub (*Costelytra zealandica*).
- 6.4. The Committee acknowledges that no New Zealand-specific host range testing has been conducted for *Neotyphodium siegelii* in meadow fescue or ryegrass, and recognise that some invertebrates, including endemic crambid species may be affected by *Neotyphodium siegelii*. However, the Committee also notes that *Neotyphodium siegelii* produces only loline alkaloids, similar to *N. uncinatum*, a meadow fescue endophyte that is already present in New Zealand. The Committee considers that since *N. uncinatum* is already present in New Zealand's pasture grasses, any crambid or other insect species likely to be affected by *Neotyphodium* alkaloids is already exposed to loline compounds, and other more toxic bioactive alkaloids.
- 6.5. The applicant explained that the loline alkaloids produced by *Neotyphodium siegelii* that are responsible for deterring insect pests are produced and accumulate in all above ground parts of the host grass, and the root system. These alkaloids are contained within the plant and do not leak into the soil or into the environment.
- 6.6. The Committee acknowledge that while grass grub is a New Zealand native invertebrate, it is also a common and destructive pasture pest, and New Zealand's agricultural industry goes to significant lengths to try and control grass grub. The applicant provided evidence that *Neotyphodium siegelii* can deter grass grub from feeding on meadow fescue and ryegrass, but it does not kill the grass grub. The Committee also noted comments from DOC in their submission that the use of *Neotyphodium siegelii* in pastures will not affect grass grub in its natural habitat, which is tussock and scrub areas.
- 6.7. The Committee noted a submission from Federated Farmers of New Zealand, which explained that since honey bees do not collect pollen from pasture grasses they will not be affected by *Neotyphodium siegelii* or the alkaloids it produces. The applicant also explained that



Neotyphodium siegelii does not grow into the pollen of its host. The Committee was satisfied that *Neotyphodium siegelii* does not pose any risk to pollen-gathering invertebrates.

- 6.8. After assessing all the information, the Committee did not identify any adverse effects on the environment, or on society and communities from the release of *Neotyphodium siegelii*.

Effects on Māori and their culture and traditions and the principles of the Treaty of Waitangi (Te Tiriti o Waitangi)

- 6.9. The Committee took into account the possible effects on the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, valued flora and fauna, and other taonga, and the principles of the Treaty of Waitangi (Te Tiriti o Waitangi).
- 6.10. After assessing all the information, the Committee did not identify any adverse effects on the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, valued flora and fauna, and other taonga, as it is highly unlikely that there will be any impacts on native flora or fauna.
- 6.11. Given the absence of identified effects to the outcomes of significance to iwi/Māori (as outlined in the Protocol '*Incorporating Māori perspectives in HSNO Act decision making*') the Committee considers the application to be broadly consistent with the principles of the Treaty of Waitangi (Te Tiriti o Waitangi).

Conclusion

- 6.12. After considering the information, the Committee did not identify any adverse effects, risks or costs from the release of *Neotyphodium siegelii*. The Committee therefore considers the risks to be **negligible**. Since the Committee did not identify any adverse effects, the Committee was not required to take into account the probability of occurrence or magnitude of any adverse effects.
- 6.13. In addition, the Committee noted that New Zealand has no international obligations relevant to the application.

7. Assessment of positive effects

- 7.1. The Committee considered the potential positive effects (including benefits) of the organism on human health and safety, the environment, society and community, relevant aspects of Māori culture and traditions, and the market economy.
- 7.2. The Committee noted the benefits outlined in the EPA staff report and considered that there may be additional benefits, as outlined below.



- 7.3. The applicant and submitters noted that insects such as grass grub, Argentine stem weevil, and African black beetle are significant pasture pests that damage pastures and reduce productivity. They explained that the use of *Neotyphodium siegelii* in meadow fescue, tall fescue, and perennial ryegrass has the potential to deter feeding and reduce the damage caused by these insects, while also increasing pasture growth and increasing drought tolerance.
- 7.4. John Caradus, who submitted for Grasslanz Technology Ltd, explained that *Neotyphodium* endophytes are already used by plant breeders, and are vital to New Zealand's agricultural sector. He noted that "*without Neotyphodium New Zealand would not have a pastoral agricultural economy*".
- 7.5. Thomas Chin, submitting on behalf of the NZPBRA explained that the advantages conferred to ryegrass through association with *Neotyphodium siegelii* included decreased damage by pasture pest insects, increased pasture growth, increased animal health, increased yield and production, and a possible decrease in pesticide use. He noted that improvements to ryegrass had the potential to bring advantages not only to farmers, but also to New Zealand's wider agricultural industry, and to the New Zealand economy.
- 7.6. The Committee considered that the use of *Neotyphodium siegelii* in pasture grasses may lead to a reduction in the use of organophosphate pesticides such as diazinon to control grass grub. This could subsequently reduce toxicity to the environment, workers and the public.
- 7.7. Michael Norris, a submitter for the NZPBRA explained that *Neotyphodium* endophytes are a vital part of the research and business conducted by NZPBRA members, and that the release of *Neotyphodium siegelii* would increase the genetic diversity of grass endophytes in New Zealand. He explained that this would provide greater choice of endophytes for potential use in pasture systems and agricultural research. Thomas Chin noted that *Neotyphodium siegelii* can already be used in Australia, South America, and the US, and that New Zealand farmers may be at a competitive disadvantage if they are unable to use it here.
- 7.8. The Committee acknowledged the significant importance of perennial ryegrass to the New Zealand pastoral sector as a forage species. They recognised the potential benefits that the release of *Neotyphodium siegelii* could provide to New Zealand's agricultural industry and the economy, as detailed by the applicant and submitters. The Committee also considered that if ryegrass were not involved as a host for *Neotyphodium siegelii* then the benefits associated with the release of this endophyte would be much lower.
- 7.9. The Committee considered that the import and release of *Neotyphodium siegelii* as a beneficial endophyte for use in fescues and perennial ryegrass is likely to be beneficial to New Zealand.



Conclusion

7.10. After considering the information, the Committee considered that there are benefits to be gained from the release of *Neotyphodium siegelii*. The Committee is satisfied that these benefits are likely to be achieved in the foreseeable future and will be **non-negligible**.

8. Achieving the purpose of the Act

8.1. The purpose of the Act is to protect the environment, and the health and safety of people and communities, by preventing or managing the adverse effects of hazardous substances and new organisms (section 4 of the Act).

8.2. The Committee took into account the following matters when considering the application in order to achieve the purpose of the Act:

- The sustainability of all native and valued introduced flora and fauna;
- The intrinsic value of ecosystems;
- Public health;
- The relationship of Māori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, valued flora and fauna, and other taonga;
- The economic and related benefits and costs of using a particular hazardous substance or new organism;
- New Zealand's international obligations;
- The need for caution in managing adverse effects where there is scientific and technical uncertainty about those effects; and
- The principles of the Treaty of Waitangi (Te Tiriti o Waitangi).

8.3. The Committee is satisfied that this decision is consistent with the purpose of the Act and the above principles and matters. Any substantive issues arising from the legislative criteria and issues raised by submitters have been discussed in the preceding sections of this decision.

9. Evaluation and weighing of positive and adverse effects

9.1. The Committee took into account all the effects of *Neotyphodium siegelii*, and concluded that they pose negligible risks, and that the benefits are non-negligible. It is therefore evident that the positive effects of releasing *Neotyphodium siegelii* outweigh the adverse effects.

10. Recommendation

10.1. The Committee recommends that the applicant lodge a fungal voucher specimen of *Neotyphodium siegelii* in a national culture collection before the endophyte is released commercially.



11. Decision

- 11.1. After reviewing all of the information contained in the application, the Committee is satisfied that the application met the requirements of section 34 of the Act. In any event, in accordance with section 59(3)(a)(ii), the Committee waives any information requirement that has not been met as requested by the applicant in its application.
- 11.2. The Committee considered that the threshold for approval under section 38 of the Act had been met. The Committee has concluded that the organisms meet the minimum standards set out in section 36 of the Act and that the positive effects of the organisms outweigh the adverse effects of the organisms, taking into account all of the following:
- All the effects of the organisms;
 - The matters in section 37 of the Act;
 - The relevant matters in Part 2 of the Act; and
 - The Methodology.
- 11.3. The Committee decided to exercise its discretion and **approve** the release of *Neotyphodium siegelii* under section 38(1)(a) of the Act. The Committee noted that in accordance with section 38(2) of the Act, the approval has been granted without controls.
- 11.4. The Committee noted that under section 38(3) of the Act, if *Neotyphodium siegelii* has not been released within five years of the date of this decision, this approval for release will lapse. However, any person may apply before the expiry of the time limit for an extension of that time limit for a further period of up to five years.**
- 11.5. The Committee has waived the requirement under section 38(4) of the Act, to notify the Authority of the release of *Neotyphodium siegelii*.
- 11.6. The Committee would like to thank all people who provided information that has been used in making this decision.

Signed

Shaun Ogilvie
Chair, Decision Making Committee
Environmental Protection Authority

Date: 27 June 2013



Amendment August 2014

- To assign the correct approval number to the new organism approved for release.



19 August 2014

Louise Malone
Chair, Decision Making Committee
Environmental Protection Authority

Date

Approval numbers for the organisms in application APP201519

Organism	Approval code
<i>Neotyphodium siegelii</i>	NOR100084

