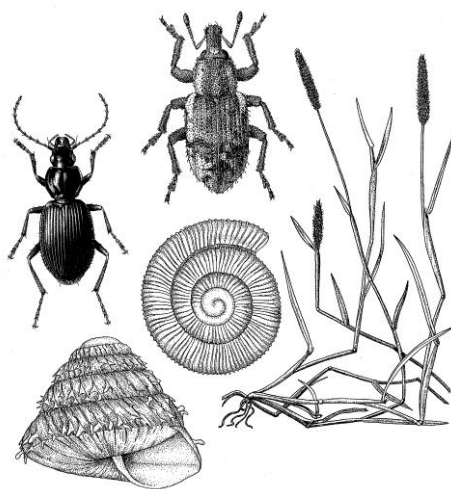


**Large-plot field evaluation of *Neotyphodium uncinatum* infected,
loline-containing, meadow fescue–ryegrass hybrid grasses in pest-
prone areas in Gippsland, Victoria.**

1. Establishment of trial plots autumn 2011.

Report prepared for Cropmark Seeds Ltd

by Gary M. Barker



G. M. Barker & Research Associates

The Invertebrate Biodiversity Specialists
Working in production agriculture and its interface with
biodiversity conservation

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Report. No. 102 May 2011

SUMMARY

This report describes the establishment of three field trials aimed at contributing to the assessment of the agronomic performance of *N. uncinatum*-infected meadow fescue-based genotypes under multi-species pest and disease burdens in dryland, commercial farming conditions of Gippsland, Victoria, Australia.

INTRODUCTION

Because of their natural role in biological protection of the grass hosts, *Neotyphodium* endophytes are widely recognised as beneficial mycosymbionts in pastoral and turf systems. There is considerable interest internationally in the development of forage and turf grasses infected with *Neotyphodium* endophytes. Understanding the role of different alkaloids in protecting plants against various herbivorous pests is critical to development of endophyte-containing grasses for commercial use.

Cropmark Seeds Ltd. has been developing forage grasses based on Meadow fescue (*Festuca pratensis*) and its loline-producing endophyte *Neotyphodium uncinatum* because of potential agronomic advantages, not least pest resistance and tolerance. Meadow fescue (*Festuca pratensis*) infected with *N. uncinatum* has been shown to deter attack from several pasture insects, as summarised in the first part of this report series to Cropmark Seeds Ltd (Barker, 2011). Among other attributes, Cropmark Seeds is particularly interested in the agronomic advantage of meadow fescue and hybrid cultivars in regions prone to the scarabaeids black beetle (*Heteronychus arator*) and Red-headed pasture cockchafer (*Adoryphorus couloni*). Black beetle is a major pest of warm temperate pastures throughout southern Australia and northern New Zealand, while Red-headed pasture cockchafer is a major pasture pest in southeastern Australia.

This report describes the establishment of field trials that will contribute to assessment of the agronomic performance of *N. uncinatum*-infected genotypes under multi-species pest and disease burdens in dryland, commercial farming conditions of Gippsland, Victoria, Australia.



MATERIALS AND METHODS

Field plot trials were sown by direct drilling at three sites in Gippsland Victoria using grass seed provided by Cropmark Seeds Ltd. Sites were prepared by kill of the old pastures using glyphosate herbicide and seed sown by no-tillage using local contractors and their equipment.

Table 1. Details of sites

	Site 1	Site 2	Site 3
Property	Balfour	Versteden	G & M Barker Family Trust
Location	186 Balfour Road, Willow Grove, Victoria 3825	465 Edgars Road, Longwarry South, Victoria 3816	125 Charltons Road, Stony Creek, Victoria 3957
Latitude	38° 4' 53.26" S	38° 09' 49.42" S	38° 36' 10.33" S
Longitude	146° 08' 10.6" E	146° 06' 44.11" E	146° 07' 10.93" E
Elevation	144 m	80 m	126 m
Stock class	Dairy	Dairy	Dairy grazers/beef
Contacts	Andrew & Caroline Balfour Phone: (03) 5635 2356 Mobile: 0427927 125 Email: abalf@dcsi.net.au	John & Lisa Versteden Phone: (03) 5629 9534 Mobile: 0407 343111 Email: jlv@dcsi.net.au	Gary & Maria Barker Phone (03) 5689 1236 Email: slug20@bigpond.com
Sowing date	14 March 2011	21 March 2011	31 March 2011
Grass seeding rate	24 kg/ha	24 kg/ha	23 kg/ha

All trials were sown with the same base treatments aimed at field comparison of AR1 *Neotyphodium lolii*-infected and U2 *N. uncinatum*-infected genotypes and included Matrix HE (*N. lolii*-infected) as a standard. None-the-less, trial designs varied among sites as necessitated by quantities of available seed and the ability of drilling equipment to accommodate small seed quantities in the hopper. Plot size was chosen to provide sufficient sampling space for periodic assessments of pest populations while accommodating undisturbed area for agronomic performance measurement. Nonetheless, plot width was varied between sites based on drill width.

In the case of Site 3, additional treatments included an endophyte-free perennial ryegrass as a control, and two 50:50 mixtures of AR1 *Neotyphodium lolii*-infected and U2 *N. uncinatum*-infected grass genotypes. Further, at Site 3, the endophyte-free treatment was sown in enlarged plots, thus enabling more intensive sampling of invertebrate populations over the next few years.



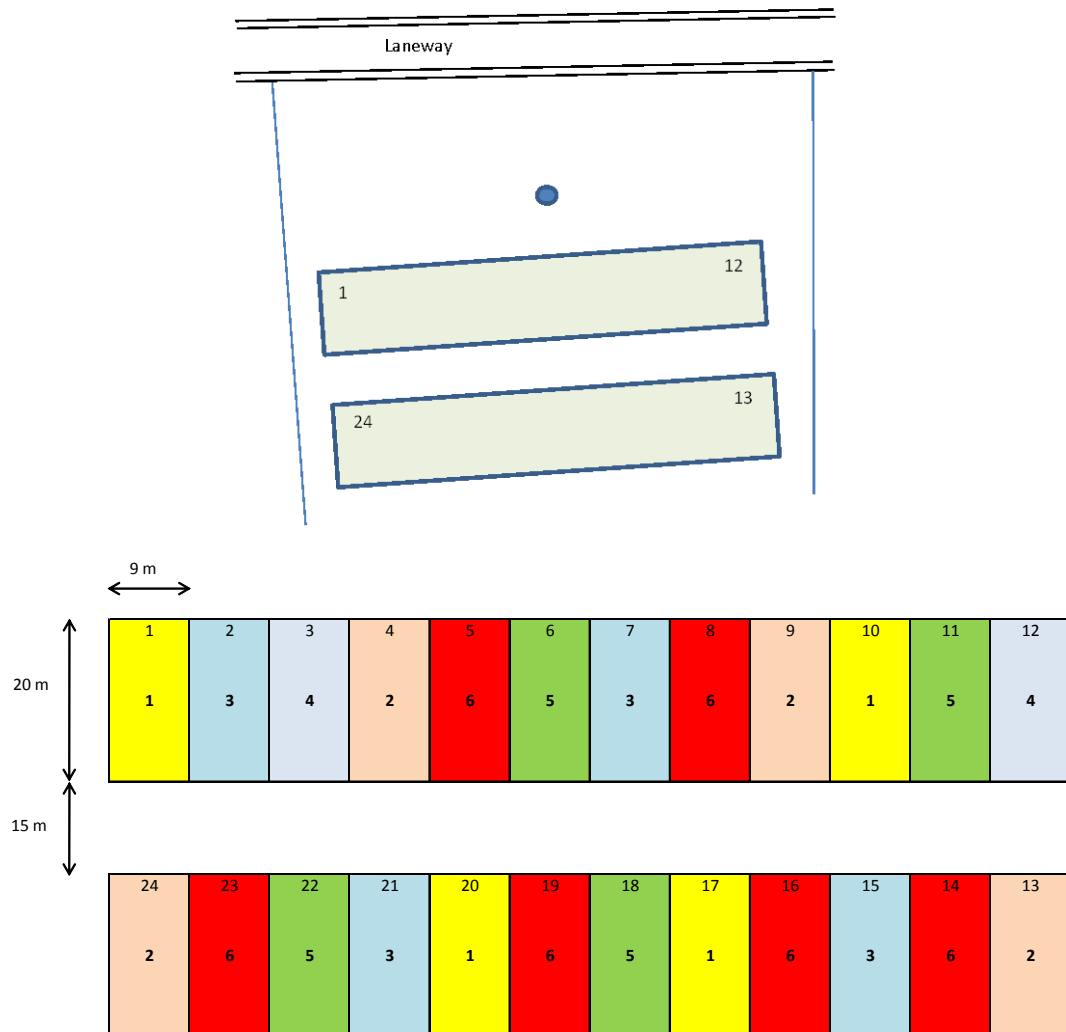
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Sites 1 and 2 were sown with grasses only at 24 kg/ha, while Site 3 was sown with grass (23 kg/ha) and clover (cv. Kopu, 3 kg/ha) mixes.

Sites were visited 3-4 weeks after sowing to confirm satisfactory establishment.

Site 1 (Balfour)

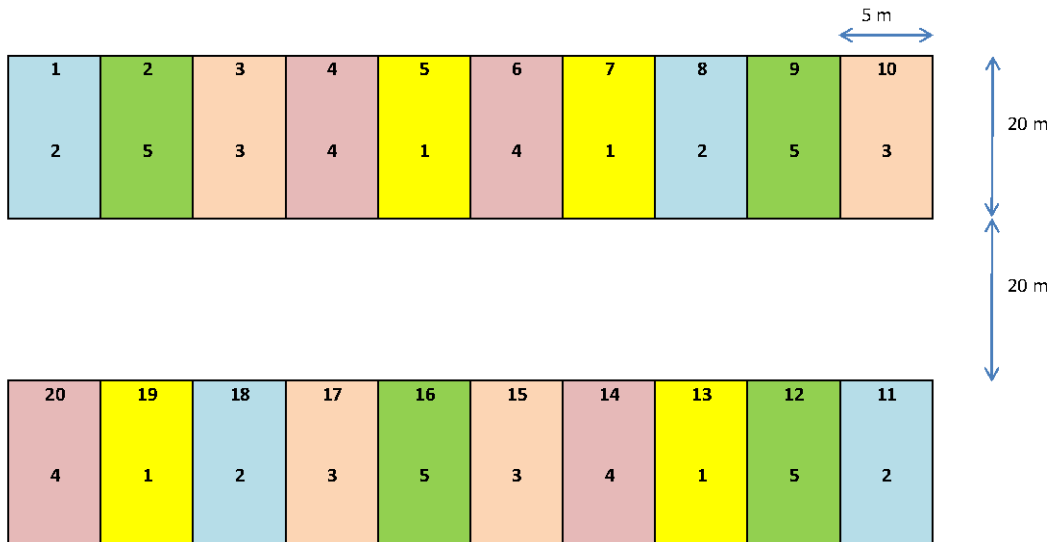
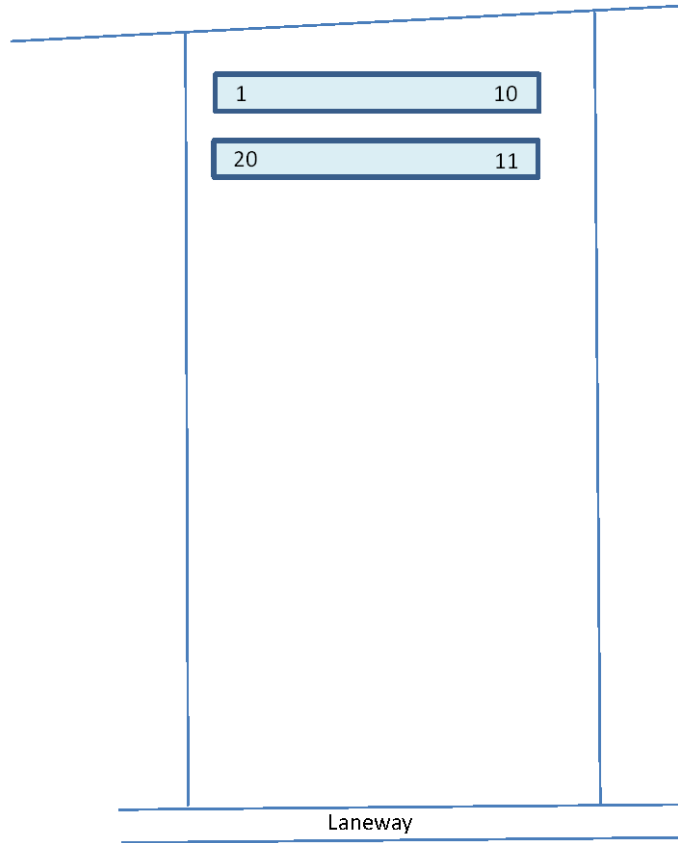


Treatments

Cultivar or genotype (Endophyte)

- 1 FH2007A (AR1)
- 2 FHCF0802(U2)
- 3 LPE0802(U2)
- 4 FHAB0802(U2)
- 5 ULTRA(AR1)
- 6 MATRIX(WildType)

Site 2 (Versteden)

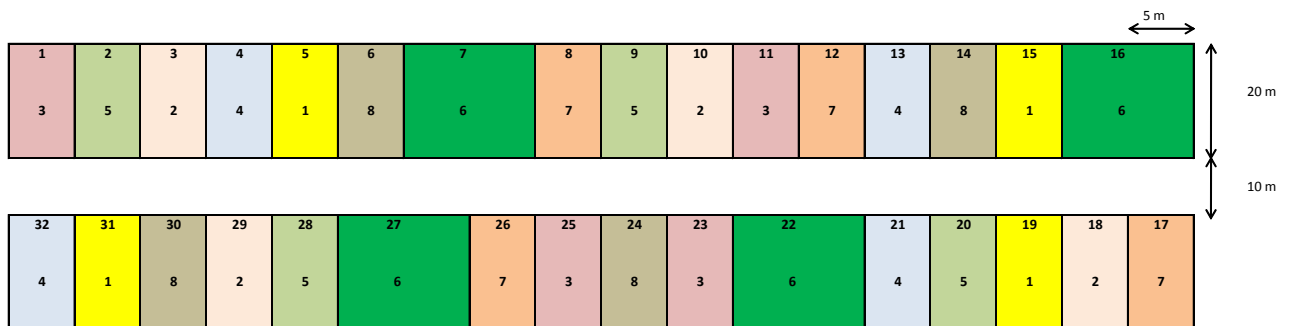
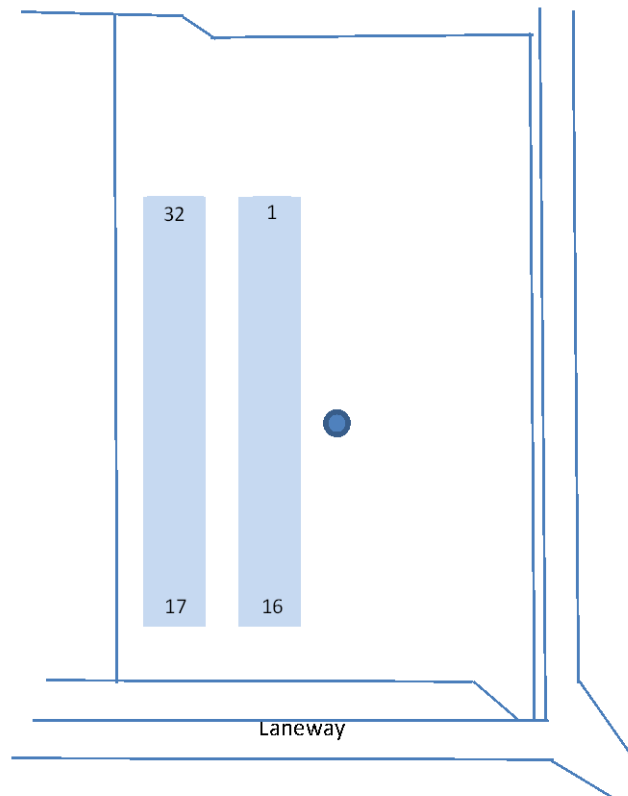


Treatments

Cultivar or genotype (Endophyte)

- 1 FH2007A (ARI)
- 2 LPE0802 (U2)
- 3 FHCF0802 (U2)
- 4 ULTRA (AR1)
- 5 MATRIX (Wild Type)

Site 3 (G & M Barker Family Trust)



Treatments

1	FH2007A (AR1)
2	ULTRA (AR1)
3	FHCF0802 (U2)
4	LPE0802 (U2)
5	MATRIX (Wild Type)
6	REVOLUTION (Nil)
7	FH2007A (AR1) + FHCF0802 (U2)
8	MATRIX (Wild Type) + FHCF0802 (U2)

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Report. No. 102 May 2011

RESULTS

High soil moisture levels and warm air/soil temperatures favoured rapid germination. Subsequent persistent overcast days slowed seedling growth. Nonetheless, visits to the sites 3-4 weeks after sowing indicated seedling populations were adequate to establish viable pastures. Variation in seedling vigour was noted among treatments.

DISCUSSION

Assessments of agronomic performance and pest burdens will commence from spring 2011.

REFERENCE

Barker, G.M. 2011. Effects of *Neotyphodium uncinatum* infected, loline-containing, meadow fescue–ryegrass hybrid grasses on the feeding behaviour of black beetle and red-headed pasture cockchafer larvae. 1. Assays with excised roots and potted plants. Report to Cropmark Seeds Ltd. G. M. Barker & Research Associates, March 2011, 20 p.