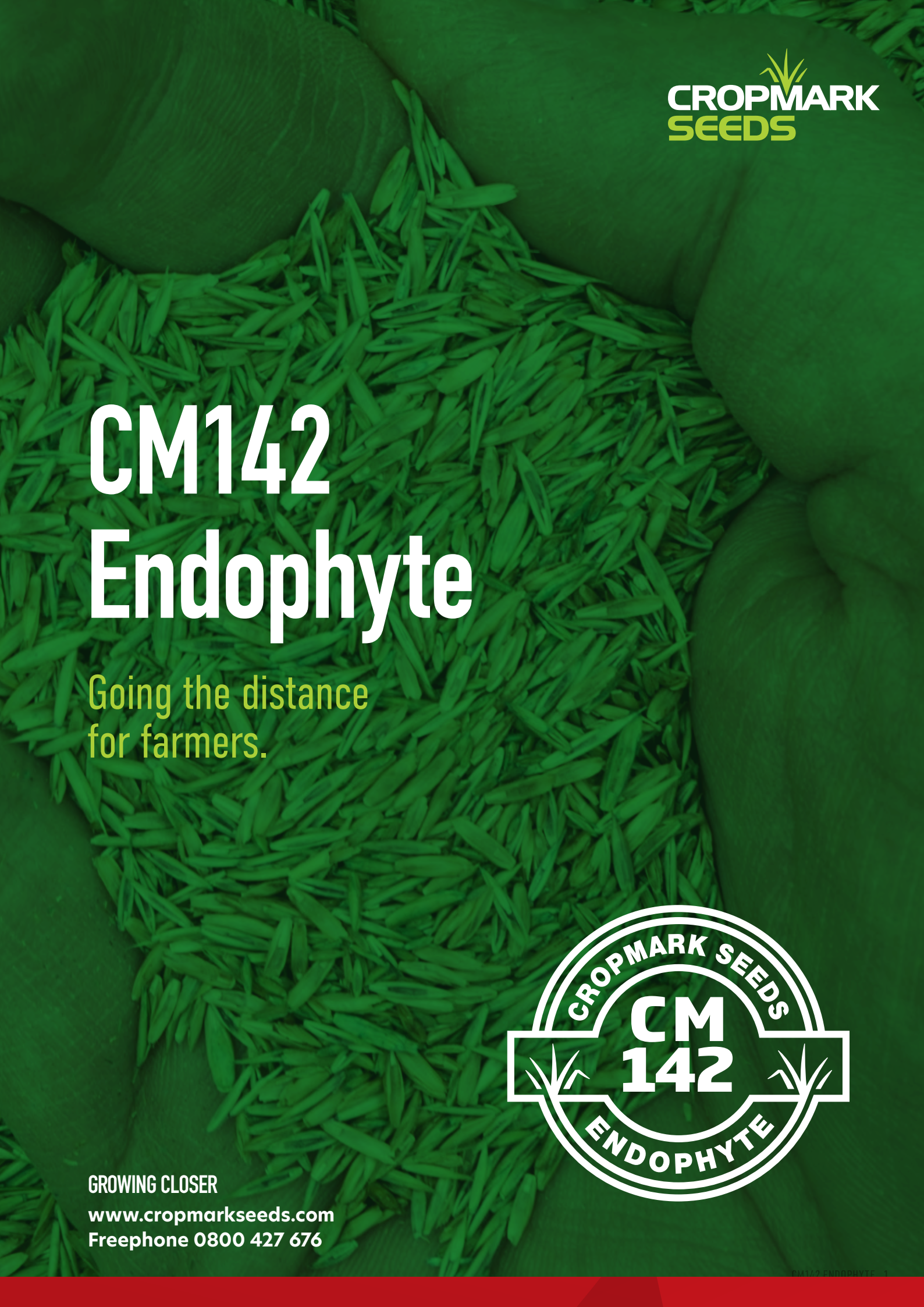
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Proven efficacy and safety of CM142 endophyte

CM142 is a groundbreaking new novel endophyte commercialised by Cropmark Seeds in 2024.

CM142 is the latest epoxy-janthitrem producing endophyte to become available for the control of insect pests in ryegrass.

Key features of CM142 endophyte:

- **Proven efficacy against the most important insect pests in ryegrass**
- **Proven animal safety with the highest 4-Star safety rating for sheep & cattle[1]**
- **Zero production of toxic lolitrem-B or ergovaline alkaloids**

The CM142 endophyte is suitable for perennial, hybrid and Italian ryegrasses. It produces epoxy-janthitrem alkaloids within a concentration range that achieves effective insect control without compromising livestock health. Cultivars Stampede CM142 and Avatar CM142 did not produce any detectable symptoms of ryegrass staggers in lambs under high-risk summer conditions.

Insect efficacy research has been conducted by independent entomologists using both controlled 'pot' experiments and field trials as appropriate. This research has tested CM142 against the following insects:

- **Argentine Stem Weevil (ASW)**
- **Porina**
- **Black Beetle**
- **Root Aphid**

[1]2024 PBRA provisional rating for sheep and lambs (++++), full rating for cattle and dairy cows ++++.

Summary of the proven efficacy of CM142

Argentine Stem Weevil (*Listronotus bonariensis*)

Five independent experiments have been completed, three pot trials and two field trials with CM142 infected diploid perennial ryegrasses. In these replicated experiments CM142 provided a significant level of protection against ASW larvae. Results did not differ significantly between the two epoxy-janthitrem producing endophytes CM142 and AR37 in a common perennial ryegrass cultivar. While epoxy-janthitrem endophytes provide protection against the ASW larval stage that causes the most plant damage, adult feeding can damage emerging grass seedlings. It is recommended to use treated seed for all cultivars in ASW prone areas.

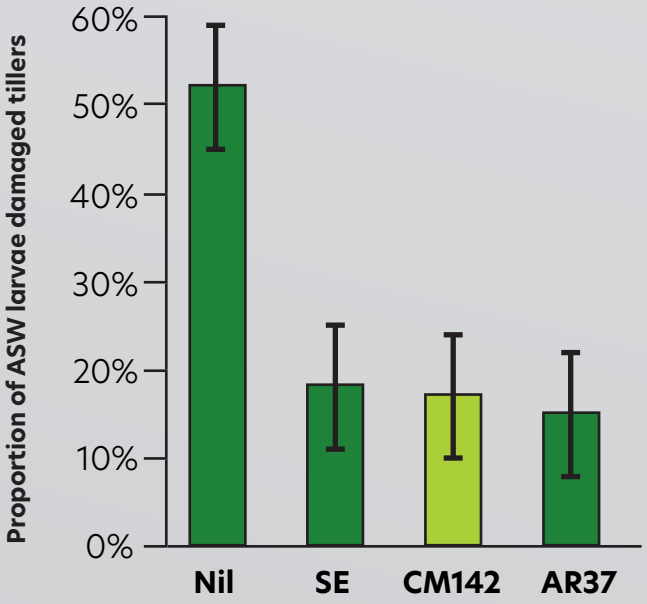

Figure 1. Proportion of tillers damaged by Argentine Stem Weevil larvae ± LSD after 32 days in a non-choice pot experiment with diploid perennial ryegrass. Independently run by entomologist G.M Barker.

Porina (*Wiseana copularis*)

Three independent pot experiments have been completed with both diploid and tetraploid perennial ryegrasses. These have shown that CM142 significantly reduces porina larvae damage to ryegrasses. Results did not differ significantly between the two epoxy-janthitrem producing endophytes CM142 and AR37 in a common perennial ryegrass cultivar.

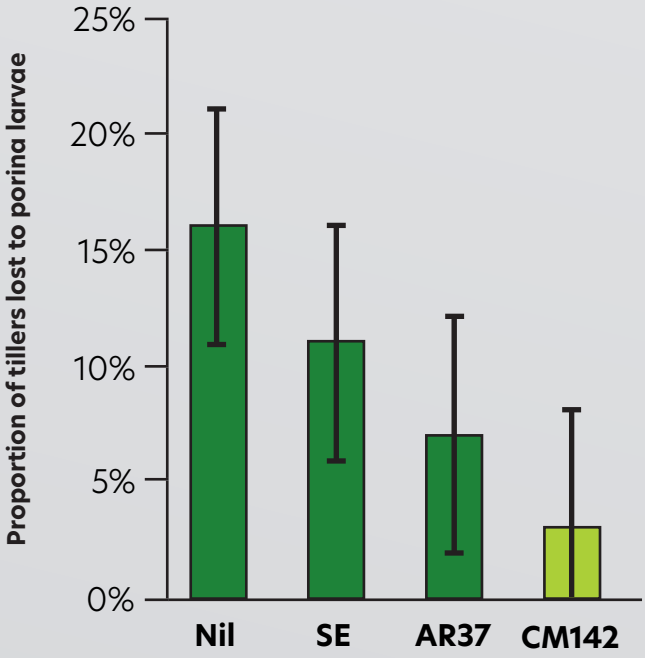

Figure 2. Proportion of tillers lost to porina larvae feeding ± LSD after 32 days in a non-choice pot experiment with a common diploid perennial ryegrass cultivar. Independently run by entomologist G.M. Barker.

Black Beetle (*Heteronychus arator*)

Two independent pot experiments have been completed with CM142 infected diploid perennial ryegrasses. In these replicated experiments CM142 substantially reduced damage to ryegrass plants caused by the feeding of Black Beetle adults. The proportion of tillers lost to black beetle feeding did not differ between standard endophyte and the two epoxy-janthitrem producing endophytes CM142 and AR37 in a common perennial ryegrass cultivar.

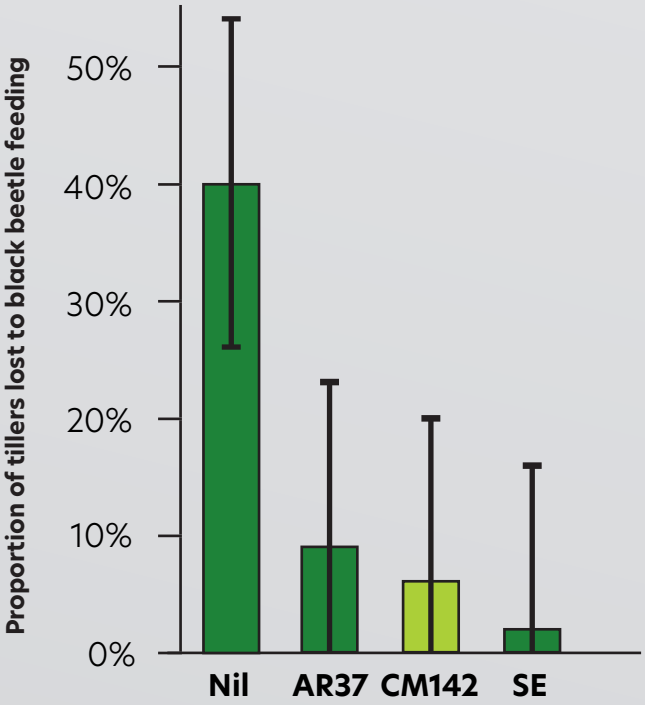

Figure 3. Proportion of ryegrass tillers lost to black beetle adult feeding ± LSD after 35 days in a non-choice pot experiment with a common diploid perennial ryegrass cultivar. Independently run by entomologist G.M Barker.

"The CM142 endophyte combined with Cropmark's latest ryegrass genetics provides a natural mechanism to increase pasture persistence"

Stephane Montel, Cropmark Seeds R&D Manager.

Root Aphid (*Aploneura lentisci*)

The CM142 efficacy against root aphids was tested using a replicated pot experiment using both diploid and tetraploid perennial ryegrasses. CM142 showed strong control of root aphid across a broad range of ryegrass cultivars. As a result, the Endophyte Technical Committee of the PBRA have rated CM142 as 4-Star ++++, the highest available rating for the control of root aphid in both diploid and tetraploid perennial ryegrass.

Table 1. Plant Breeding and Research Association 2024/25 Endophyte Control ratings for Root Aphid in perennial ryegrass.

Endophyte Brand	Diploid Perennial ryegrass	Tetraploid Perennial ryegrass
AR1	No control[1]	No control[1]
AR37	++++	++++
CM142	**++++**	**++++**
NEA2	++	++
NEA4	++	Not tested
NEA12	++++	Not tested
Standard Endophyte	++	Not tested

++ Moderate control: Endophyte may provide some practical protection, with a low to moderate reduction in insect population.
++++ Very good control: Endophyte consistently reduces insect populations and keeps pasture damage to low levels, even under high insect pressure.
[1]AR1 plants are more susceptible to root aphids than plants without endophyte.

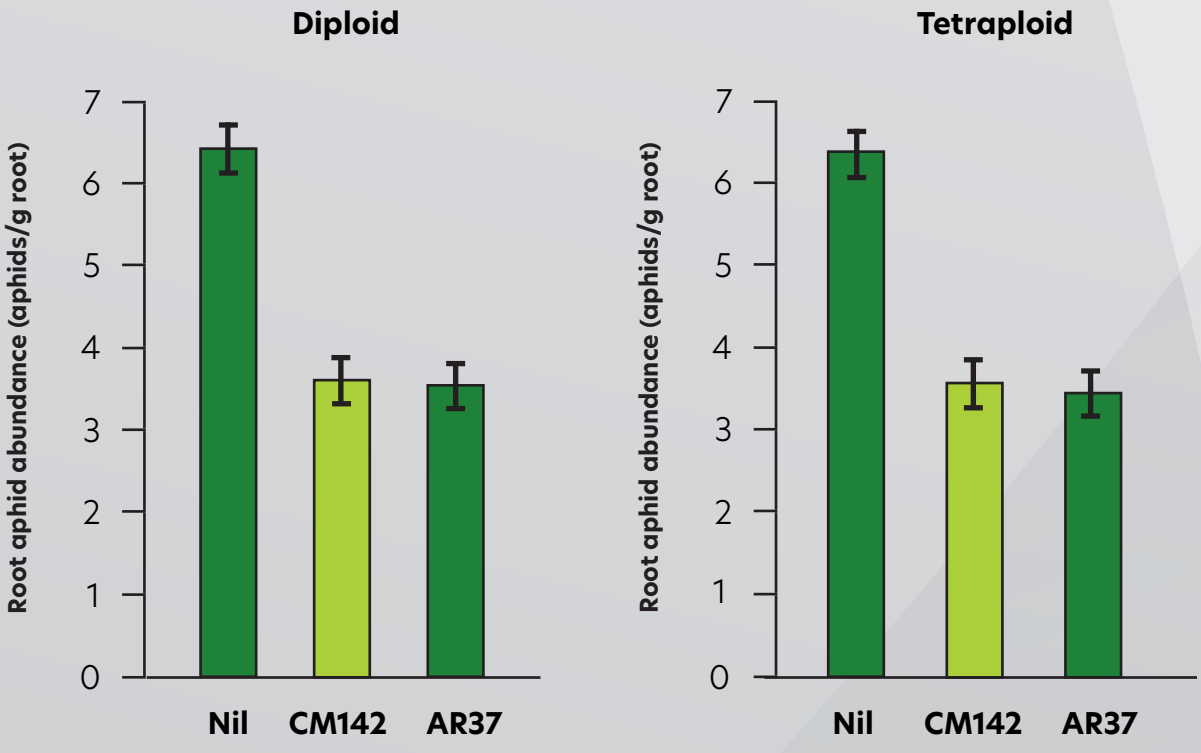

Figure 4. Root aphid abundance ± LSD after 14 weeks in a pot experiment with diploid (Matrix) and tetraploid (Avatar or Base) perennial ryegrasses. Independently run by entomologist G.M. Barker.

Proven Animal Safety of CM142 endophyte

CM142 endophyte has the highest, 4-Star, safety rating from the Plant Breeding and Research Association[1]. CM142 is compatable with a high level of animal performance, it is very unlikley to cause ryegrass staggers or heat stress and does not produce Lolitrem-B or ergovaline toxins.

[1]2024 PBRA provisional rating for sheep and lambs (++++), full rating for cattle and dairy cows ++++.

Comprehensive animal safety evaluation has been run for CM142 prior to its commercial release. It has been tested in 9 different ryegrass cultivars including diploid and tetraploid perennial ryegrass, hybrid ryegrass and Italian ryegrass with experiments run across three separate years.

Stampede CM142 and Avatar CM142 have very high animal health credentials relative to other endophytic perennial ryegrasses that also provide control of important insect pests: Argentine Stem Weevil, Porina, Black Beetle and Root Aphid.

- CM142 endophyte does not produce the alkaloids that commonly cause ryegrass staggers (Lolitrem-B) or heat stress (Ergovaline).
- Research has found **Stampede CM142** and **Avatar CM142** did not cause any detectable symptoms of ryegrass staggers – an exciting new level of livestock safety is emerging as our research continues.

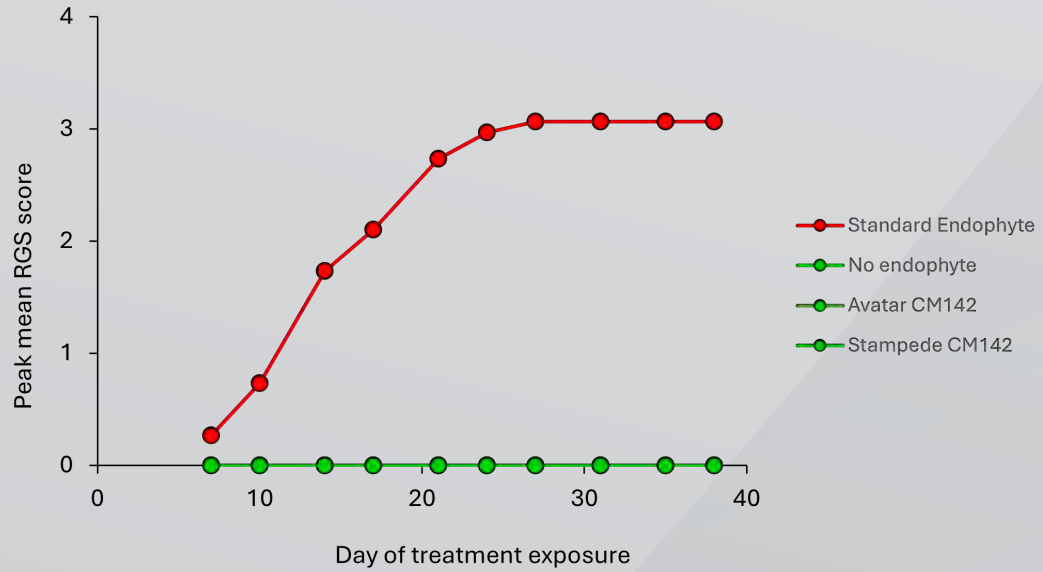

Figure 5. Peak mean ryegrass stagger (RGS) score of 30 lambs within each of four perennial ryegrass treatments within a replicated animal safety experiment. Only lambs grazing Standard Endophyte developed stagger symptoms. Independently run by Ag Evaluate, animal ethics approval AEC2023/58, Summer 2024, Selwyn District, Canterbury.

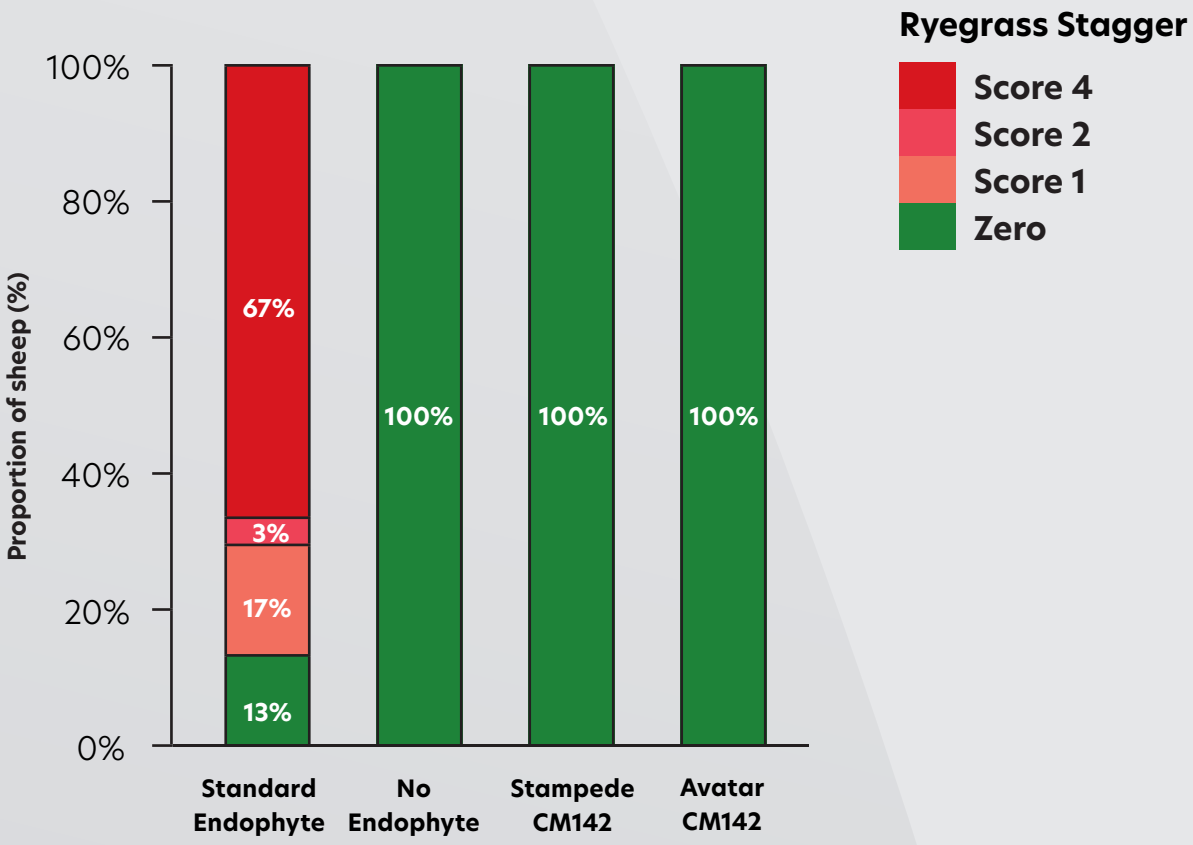

Figure 6. Ryegrass stagger score levels on the Keogh scale of lambs within a replicated animal safety experiment. Score zero indicates no symptoms, score 4 indicates loss of coordination requiring shifting immediately to a safe pasture. Independently run by Ag Evaluate Ltd, animal ethics approval AEC2023/58, Summer 2024, Selwyn District, Canterbury.

"CM142 provides an exciting new option for effective insect protection combined with a high level of animal safety."

Dr Matthew Deighton, Cropmark Seeds Technical Manager.

Disclaimer: *In an animal safety trial conducted in Canterbury, no ryegrass staggers were observed in lambs grazing Stampede CM142 or Avatar CM142, whereas ryegrass staggers were observed in lambs grazing a Standard Endophyte cultivar. While CM142 is very unlikely to cause ryegrass staggers in sheep or cattle, as with all novel endophytes, under extreme conditions and poor grazing management, especially during late Summer/Autumn, staggers could potentially occur. CM142 has not yet been tested with deer and no evidence of safety is available for horses or other species.*