The effect of novel endophyte and insecticide seed treatment on the establishment of long rotation or perennial ryegrass plants in the presence of adult Argentine stem weevil (*Listronotus bonariensis*)

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Introduction

Argentine stem weevil (*Listronotus bonariensis* (Kuschel)) is a recognised pasture pest throughout most regions of New Zealand including an increasing threat to the southern half of the South Island (Popay *et al*. 2011). Mitigation options for control of adult Argentine stem weevil (ASW) during establishment of ryegrass are available. The following study investigated the potential for seed infected with novel endophytic fungi *Neotyphodium* sp.(Clavicipitaceae: Hypocreales) and/or seed treated with systemic insecticide to improve the survivability of ryegrass seedlings in the presence of adult ASW in South Otago, New Zealand.

Methods

Cultural

In November 2008, numbers of adult ASW were determined in a number of paddocks throughout the South Otago region. The paddock identified at Inch Clutha, South Otago with the highest counts (80/m^2) was utilised as the trial site. In December 2008, the area was sprayed at with 4 l/ha of glyphosate, and then re-sprayed with 2 l/ha in late January 2008. Dead herbage was removed by grazing.

Trial Design

A randomised block trial was sown directly into the sprayed paddock area on the 11th February 2008 with 5 replicates. Each plot measured 3 m by 10 m and was sown in 20 rows at 150 mm apart. Treatments tested were: Diploid perennial ryegrass (DPR; cv. Extreme) with no endophyte (nil), AR1 or AR37 endophyte; Tetraploid long rotation ryegrass (TLR) with no endophyte or Endo5 endophyte (cv. Banquet II) and; seed not treated (-T) or seed treated (+T) with a systemic insecticide (Superstrike®). Sowing rate of each treatment combination was adjusted for differences in seed size and germination to give 600 seeds/m^2. Thousand seed weight (TSW) was measured for each treatment with the only major difference being between diploid (TSW: 2.5 g) and tetraploid ryegrass (TSW: 3.8 g), the addition of seed treatment had a negligible effect on TSW. Thirty six days after sowing, plant numbers were counted (5 per plot) and plant heights (10 per plot) measured for the different treatment combinations. The number of plants down a 0.67 m row were counted to give number of plants/0.1 m^2 (*e.g.* 0.66 m x 0.15 m) and multiplied by 10 to give per m^2. Plant heights were measured from the base of the seedling to the top of the tallest tiller.

Statistical analysis

Results were analysed as a factorial design using Analysis of Variance by GenStat® (v14 statistical software, GenStat VSN International, Hemel Hempstead, UK.).

Results

Irrespective of the presence or absence of endophyte, the number of ryegrass seedlings was significantly (P<0.01) increased by seed treatment (Fig. 1). Plant counts were 40% and 29% greater for DPR+T and TLR+T respectively, compared with DPR-T and TLR-T. The presence of endophyte conferred some protection against ASW for DPR with AR1 and AR37 endophyte, significantly (P<0.01) increasing seedling numbers by 20% and 29% more than DPR lines containing no endophyte, respectively (Fig. 1). Similarly for TLR, seedling numbers were increased by 31% for seed lines containing Endo5, compared with TLR seed lines that contained no endophyte (P<0.01)(Fig. 1). There was a non-significant interaction between seed treatment and endophyte for seedling numbers. Plant height was significantly (P<0.01) increased by seed treatment for both TLR (-T 71 mm, +T 75 mm) and DPR (-T 66 mm, +T 71 mm). Presence of endophyte had no significant effect on plant height.

Discussion

The trial confirmed that seed treatment is an appropriate management practice of protecting ryegrass seedlings during the establishment period from the damage by adult ASW. Seed treatment also increased plant height; however it needs to be further explored if this is related to ASW control or other factors relating to the presence of seed treatment. Long term novel endophytes such as Endo5, AR1 and AR37 in ryegrass are a recognised means of ASW protection (Popay *et al*. 2011). The current trial also provided further evidence that endophyte alkaloids present in the seed or produced early during the establishment period may offer some protection from adult ASW (Stewart *et al.*

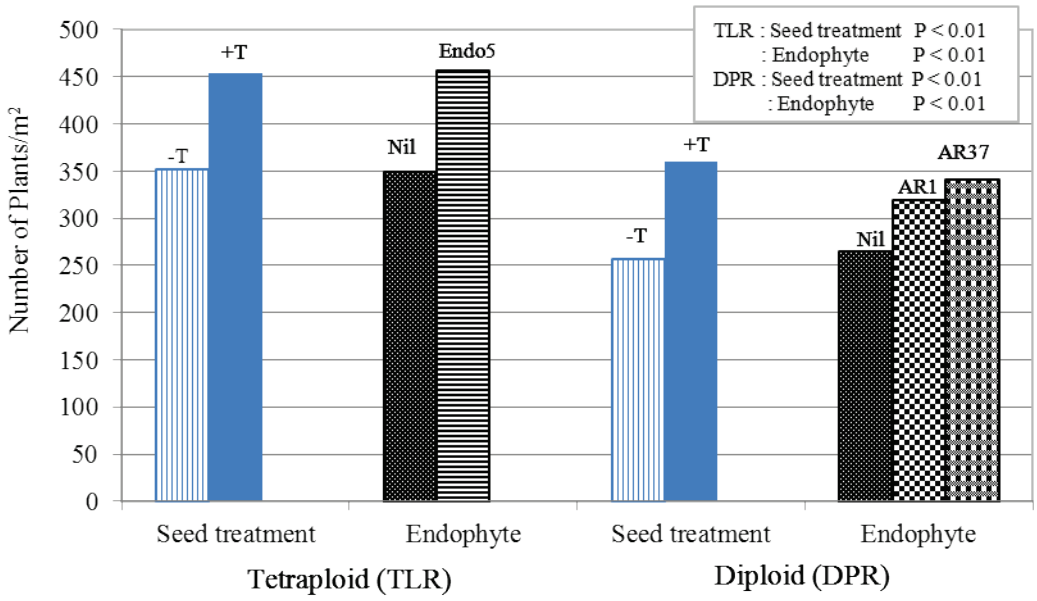

Figure 1. The effect of novel endophyte and insecticide seed treatment on the number of ryegrass plants (per m^2) for diploid perennial (DPR) and tetraploid long rotation (TLR) ryegrasses.

1985). There was also a trend for tetraploid ryegrass to have higher plant numbers during establishment than diploid ryegrasses regardless of seed treatment or endophyte. The underlying factor for this requires further explanation.

Conclusion

Findings from the trial have important implications for the successful establishment of ryegrass based pastures. In areas at risk from ASW damage it is recommended to sow ryegrass infected with an appropriate novel endophyte for both short and long term control and use a seed treatment with systemic insecticide to protect the seedling during the establishment period.

References

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