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**The effect of applications of different nitrogen types and  
potassium on seed quality and AR37 endophyte presence at  
different spikelet and floret positions of perennial ryegrass cv.**

**Halo**

**A thesis presented in partial fulfilment of the requirements for the degree of**

**Master of AgriScience**

**in**

**Seed Science and Technology**

**at Massey University, Palmerston North**

**New Zealand**



**UNIVERSITY OF NEW ZEALAND**

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**2014**



## Abstract

Nitrogen has been considered as an important nutrient in the terrestrial system. In the seed production of ryegrasses, one of the most popular pastures used in New Zealand and other temperate-zone areas, the application of nitrogen is responsible for improving seed yield and seed quality. Novel fungal endophytes are also now commonly used in perennial ryegrass pasture systems. The effect of different forms of nitrogen on seed quality and endophyte infection frequency and alkaloid concentration including spikelet/floret positional effects is also of interest to researchers. This study was designed to determine the effects of three nitrogen forms and potassium treatments (six in total) on the seed quality (purity, thousand seed weight (TSW), and germination) and AR37 endophyte presence in the offspring seedlings of the perennial ryegrass cv. Halo at three spikelet positions (top, middle and bottom). Also the effect of two nitrogen forms (nitrate and ammonium) at different floret positions was investigated.

The two nitrogen forms (urea and nitrate) with potassium had a poorer seed quality compared with the control and all nitrogen treatments applied without potassium. Nitrogen application (any form by itself) did not affect TSW of 'Halo', but a reduction was found under urea or nitrate with potassium. Also, seed germination percentages were not affected by nitrogen type when compared with the control, but urea with potassium gave a lower germination than the three nitrogen forms alone; and nitrate with potassium was lower than just the urea treatment. In the purity test, urea applied alone had a higher pure seed percentage than the control and the other nitrogen forms applied alone, but, again, the nitrogen with potassium application had the poorest performance in the test. On the other hand, none of these seed quality parameters differed among the three spikelet positions (top, middle and bottom). Both nitrogen and potassium application and different spikelet positions did not affect endophyte content in the offspring seedlings of 'Halo'.

In the minor experiment, where seven floret positions and only two nitrogen forms (ammonium ( $\text{NH}_4^+$ ) and nitrate ( $\text{NO}_3^-$ )) were compared, the individual seed weights

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of Halo in florets 3, 4, and 7 under nitrate application were higher than that under ammonium. The seed weight in floret 7 was the only position lower than floret 1 and 2 when ammonium was applied. The germination percentages were not affected by the two nitrogen forms, nor were different floret positions. Further, nitrogen application also did not alter empty seed percentages (in frequency), but the basal florets produced less empty seeds. Differences in endophyte content between ammonium and nitrate applications were found only in floret position 1 where nitrate reduced endophyte. Also amongst florets under nitrate there was higher endophyte content in floret positions 2, 4 and 7.

## **Acknowledgements**

I would firstly like to thank my supervisors, Mr Craig McGill and Mr Robert Southward, for their feedback, advice and constructive criticism throughout this study.

I would also like to thank Dr Phil Rolston and all the staff at AgResearch Lincoln, Canterbury, for kindly allowing me to use seed from their trials as my experimental material and for their much appreciated assistance.

Thanks to Dr Stuart Card and all the staff at AgResearch Grasslands, Palmerston North, for kindly guiding and allowing me to carry out a major part of the experiments (endophyte testing) on their premises and for their appreciated assistance.

I would also like to thank Mrs Kay Sinclair, Institute of Agriculture and Environment, Massey University, for her assistance with the experiments.

Finally, a special thank you to my family for their support throughout this study and thanks to Minshu Xu, my girlfriend, for her patience and assistance with the experiments.

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