

QUARTERLY PROGRESS SUMMARY: July - September 2017

A New Vision for Pastoral Agriculture through Seed and Nutritional Technology Development

Summary of progress during this quarter

- We have focussed on testing AR501 endophyte-infected ryegrasses for tolerance to grass grub, preparing plants for seed production this summer, further testing for endophyte transmission, along with selection for improved agronomic performance within the breeding pools. Field trials to date have confirmed that the insect resistance of AR501 is better than standard endophyte and much better than AR1.
- Our first PGP-endophyte (ARY) has been shown to reduce *P. chartarum* infection levels to those achieved with tall fescue (the standard for low facial eczema infection) under field conditions. We have also continued testing ARY for viability in stored seed in the Margot Forde Germplasm Centre, and conducted pilot studies to optimise assays to quantify the effects of 22 other PGP-endophyte strains on *P. chartarum* spore and sporidesmin accumulation. The seed increase of our best PGP-endophyte for evaluation and animal safety at Lincoln is on-track.
- Our feed conversion efficiency project has continued to provide excellent results with the best 30 of more 4,000 progeny identified as having optimal expression of our key trait and strong agronomic performance. We are also analysing the data from our field trial which is nearing completion. Both pieces of work will determine our breeding programme for the next quarter.
- Testing of Pallaton raphno has shown very low glucosinolate content in both 2015 and 2016 trials. A Pallaton raphno essential grower toolkit has been developed to support placement of Pallaton in farming systems and to give growers a greater understanding of what can be expected from Pallaton.
- Firefly kale is entering pre-commercial evaluation across New Zealand to optimize its regional fit in farming systems. An animal safety trial has also been planned for Canterbury in 2018.
- A number of new interspecific hybrids have been confirmed with DNA markers.

Key highlights and achievements

- Our elite perennial ryegrass selections with AR501 endophyte have improved bioactivity and excellent agronomic performance, outperforming more than 100 other entries across 8 locations in New Zealand. Our first selection has been entered in the official National Forage Variety Trials. A series of animal safety trials have shown strong animal performance results without any adverse animal health problems demonstrating the animal safety of this endophyte. The nucleus seed crop harvested in 2017 had 88% endophyte transmission and will not be advanced. However, the genetic control of our AR501 endophyte transmission has been determined and the optimal method for progressing this to a commercial product in both diploid and tetraploid perennial ryegrass is underway.
- New diploid and tetraploid AR501 selections are being multiplied this year.
- The effect of PGP-endophytes on facial eczema spore counts have been assessed under field conditions demonstrating a 30% reduction in *P. chartarum* spore counts under severe infection conditions. The histology and haematology results from our first animal toxicology study have shown no adverse effects in small animal studies.
- We have demonstrated improved water-use efficiency (+38%), aphid tolerance (+32%), clubroot resistance (100%), lower glucosinolate levels (-80%), excellent seed yield potential and improved agronomic performance (+14% DM yield) of our new hybrid brassica compared to Goliath rape

across a range of regional sites. Furthermore our cattle grazing trial resulted in ~30% higher liveweight gain per hectare without any increase in brassica associated liver disease. Initial on-farm studies have also shown strong improvements in lamb finishing systems with >\$2,000/ha profitability gains compared with forage rape and grass pasture.

- A nucleus crop of Pallaton raphanobrassica in early 2016 and two further crops grown in Canterbury in 2017 were successfully harvested with yields exceeding the target of 1500 kg/ha. Approximately 1,200 ha of Pallaton were sown across NZ in 2016/17 and DM yield and liveweight gains to date have been very encouraging. A stand at the national field days at Mystery Creek highlighted the knowledge we have developed from on-farm use of this project over the past year. Pallaton is in its 2nd year of Plant Variety Rights examination.
- HT-C Kale (Firefly) is proving tolerant to Telar herbicide under worst case scenarios and has shown good agronomic performance at regional evaluation sites. A pre-nucleus seed increase has been harvested in Canterbury and pre-commercial testing of Cleancrop Firefly kale across approximately 1,000 ha is underway. A Plant variety rights application has been submitted.
- Several new interspecific brassica hybrids have been developed and are beginning evaluation.

Upcoming

- Results on selection for improved grass grub resistance of AR501 will be reported in the next quarter and draft seed production management guidelines will be completed.
- The effect of our PGP endophyte on herbage mass will continue to be monitored and the seed multiplication at Lincoln will be prepared for harvest.
- A major field trial for our improved feed conversion efficiency project will be completed and results analysed. Elite selections will be crossed to generate ~300 crosses for testing in 2018. Planning for a new field trial will begin.
- Wide-spread testing of Firefly (HT-C) kale across New Zealand will begin this year including cattle grazing studies in Canterbury and Southland.

Investment

Investment period	Industry contribution	MPI contribution	Total investment
During this Quarter	\$304,537	\$250,744	\$555,281
Programme To Date	\$5,633,351	\$5,380,309	\$11,013,661