

## Establishment and growth of legumes in acid soils in the Falkland Islands

S. Radic<sup>1,3</sup> and J.H. McAdam<sup>1,2</sup>

<sup>1</sup> Queen's University, Belfast, UK. <sup>2</sup> Agri-Food and Biosciences Institute, Belfast, UK.

<sup>3</sup> Magallanes University, Punta Arenas, Chile. E-mail sergio.radic@qub.ac.uk & jim.mcadam@afbini.gov.uk

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**Introduction** The main problems with sheep production in the Falkland Islands (FI) are mainly a function of the low quality of native pasture and are; (a) low ewe live weights reduce ovulation rate and subsequent ewe and lamb survival, (b) lifetime performance of lambs (low lambing percentage-60%, high percentage mortality-10-20% and low lamb birth weights x kg-), (c) significant ewe live weight loss through winter and early spring, (d) Hogget live weight loss during winter and early spring increases death rates and productivity of those that survive. Forage crops can help improve this situation as they have better quality and, in some cases, quantity of production than native grasslands. Legumes are a good source of feed as they have high protein content, better yield in mixtures and fix Nitrogen. Also FI soils have a low pH, low Ca & P, synthetic fertilizer is expensive and is not compatible with organic production systems. One alternative is to use locally-found Calcified Seaweed (CS-an acceptable organic material to raise the pH, Ca & other minerals). The overall aim of this work is to investigate the effect of acid soils on legume establishment, growth and nitrogen fixation in the FI.

**Materials and methods** Two groups of experiments were conducted,

1. In a controlled environment at Queen's University Belfast, **a**. In an experiment in pots, the effect of different doses of Calcified Seaweed (CS) on growth of legumes (*Trifolium repens* var. Gwenda, *Lotus Corniculatus* var. Leo and *Lotus Uliginosus* var. Maku) was investigated, **b**. In soil incubations with different doses of CS and different particle size distribution (< 0.25 mm and > 2.4 mm) at two different temperatures (11°C×75 days and 60°C×4 days) and lime as a control.

2. Field experiments in the FI, at Bold Cove, Hope Cottage, Saladero and Shallow Harbour. At each farm grazing exclusion cages were used in established reseeded to measure the yield, chemical composition and nitrogen fixation of the legumes during the growing season (October-February). Data collected was used to measure how much nitrogen is being fixed using <sup>15</sup>Nitrogen-isotopic techniques. The soil <sup>15</sup>N-enrichment to measure N<sub>2</sub> fixation, have been extensively reviewed (Ledgard and Peoples, 1988; Witty et al., 1988).

**Results and discussion** *Trifolium repens*-based swards fixed 60; 63; 65; and 67 kg N/ha, with a range between 31-95 kg N/ha depending on the site during season 1. At the three lowest doses of CS, Al and pHw were unaffected by particle size, however at the two higher doses of CS Al was reduced, at the higher dose only pHw increased with increasing particle size in an incubation experiment (60°C). For pH in water the difference between doses of 0 g/kg and 6.4 g/kg is 0.47 points (< 0.25 mm) and 0.11 points (> 2.4 mm) in comparison to a control value of 0.67. From these results, it would be best to mill the CS to improve the pHw and decrease the exchangeable Aluminium (Al).

**Table 1** Statistic differences between treatments to Ca (meq/100g), Al (meq/100g) exchangeable and pH in water.

Doses of CS g/kg (tonnes/ha)	Control			Particle size distribution					
	Lime			< 0.25 mm			> 2.4 mm		
	Ca	Al	pHwater	Ca	Al	pHwater	Ca	Al	pHwater
0 (0)	1.02d	8.01a	4.41d	1.02e	8.01a	4.41c	1.02d	8.01a	4.41b
0.8 (0.63)	1.42dc	7.34b	4.48d	1.57d	7.69ab	4.43c	1.63c	7.61ab	4.45ab
1.6 (1.26)	1.89c	6.62cB	4.61cB	2.16c	6.87bA	4.53bAB	1.92c	7.24bA	4.48abA
3.2 (2.52)	2.73bA	5.16dC	4.77bB	3.50bB	5.95cB	4.62bAB	2.68bA	6.73bA	4.53aA
6.4 (5.00)	4.65aA	2.77eC	5.08aC	6.21aB	3.94dB	4.88aB	6.04aB	6.26bA	4.52aA

Values with different lower cases in the column are statistically different for doses. Different upper cases in the row are statistically different for particle sizes.

**Conclusion** It can be concluded from the first years' data that doses of calcified seaweed and particle sizes significantly affected the release of nutrients from incubated soils. Finer CS material had a better reaction with the soil and released nutrients faster than coarse CS. Nitrogen fixation rates in the Falkland Islands range from 31-95 kg N/ha.

### Reference

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