BCRC BEEF CATTLE RESEARCH COUNCIL
RESEARCH FACTS
RESEARCH & TECHNOLOGY DEVELOPMENT FOR THE CANADIAN BEEF INDUSTRY

Keeping legumes in pasture stands longer

Project Code:	FRG.09.17
Completed:	*In Progress. Results expected in March 2023.*

Project Title:

Sustaining the legume component of grazed pasture mixtures for summer grazing and stockpiling complex mixtures in Eastern Canada

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Background:

Results from previous Beef Science Cluster projects have identified legume-grass mixtures that perform well in Central and Eastern Canada. However, the legumes have quickly dropped out of the mixed stands, leading to a decline in pasture and animal productivity. The potential ability to establish legumes using sod- or frost-seeding has been demonstrated, but results are variable and likely depend on grazing and fertility management. Carbon sequestration in soil organic matter can also be enhanced by adding legumes to grassland. Overcoming challenges related to legume establishment, seedling vigor, acidic soils, and moisture extremes would help keep legumes in pasture stands and benefit pasture health, carbon sequestration and animal productivity.

Objectives:

To increase the amount of herbage yield and quality of complex pasture mixtures through nutrient management strategies, refined grazing management, novel and enhanced stand renovation technologies, and plant genetics. Researchers will also identify cultivars and new germplasm with significant adaptation to grazing, extreme weather events, and/or negative soil attributes. Complex mixtures of legumes and grasses will be stockpiled for extended grazing and a database of soil nutrient changes in response to management as it relates to soil carbon sequestration and impact on pasture productivity will be developed.

What They Will Do:

Alfalfa, trefoil or red clover cultivars will be grown in growth cabinets with and without seaweed extract, oligo-chitin, or oligo-chitosan as growth promotants. Germination rates, emergence, seedling vigor, plant height, regrowth and root morphology will be recorded. Results will be field tested at Nappan, Normandin and Quebec City over 3 years.

To evaluate seeding method and grazing intensity and frequency on forage legume renovation, alfalfa and trefoil (three cultivars each) will be frost- vs. sod-seeded at Nappan, Normandin and Quebec City. Once established, the stands will either be mechanically harvested three times per season or rotationally grazed (high stocking density, low stocking density or fall stockpiled). Legume density, plant composition and yield will be evaluated.

To evaluate the effect of grazing management on legume establishment and persistence, animal performance, and soil carbon dynamics, 12 paddocks will be overseeded with alfalfa or trefoil (three cultivars each), then grazed at high (moved twice daily), medium (moved every 4 days) or low density (moved every 8 days). Growth rate, backfat, grazing days, forage yield, quality and composition will be measured. Soil will be assessed for carbon, nitrogen and over a five-year period.

To identify new breeding lines of alfalfa, trefoil and red clover with adaptation to acidic soil conditions, cultivars of each will be hydroponically grown at acidic or neutral pH. Plants and roots will be sampled after 1, 7 and 14 days. Some plants will be transplanted to a field with acidic soil, and bloom dates,

seedling vigor and yield will be assessed to identify superior cultivars.

To identify new breeding lines of alfalfa, trefoil and red clover with adaptation to waterlogged soil conditions, similar experiments will be conducted in field plots where water levels can be controlled and varied.

To assess fertility management to increase the persistence of forage legumes on marginal soils, alfalfa, birdsfoot trefoil and red clover will be frost- or sod-seeded into acidic or limed soils at Nappan and Normandin and subjected to three fertilizer regimens: 0 vs. 25 vs. 80 kg nitrogen/Ha, 120 kg potassium/Ha vs. soil test recommendations, or 0 vs. supplemental supplemental. Legume density, composition and yield will be assessed.

Researchers will then look at over-seeding legumes into existing complex mixtures for late fall grazing. Timothy or tall fescue pastures at Nappan, New Liskeard and Normandin will be seeded with strips of alfalfa, trefoil or red clover. Pastures will be grazed or cut until mid-summer, then stockpiled until November. Legume persistence, yield, and quality will be evaluated over 3 years.

Finally, legumes will be over-seeded into naturalized pastures for late fall grazing. Naturalized pastures at Agriculture Agri-Food Canada Nappan or the University of Guelph will be sod-seeded with trefoil, tall fescue and timothy or with alfalfa, tall fescue and timothy in spring. Weaned calves will be grazed in late fall. Animal growth, forage yield, quality, establishment and persistence of seeded species will be evaluated over three years.

Implications:

This project will identify legume genetics, seeding practices, and grazing management practices that will enable legumes to become established and maintained in mixed grass pastures on marginal lands to improve the competitiveness of Central and Atlantic Canada’s forage and beef sectors.

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