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Kura clover (*Trifolium ambiggum*) seed production and establishment in Alberta.

by

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Prologue

Our interest in Kura clover began in 1999. Dr. Jane King was introduced species in Australia, and obtained a research grant to look at its potential in Alberta. At that time, Kura clover had never been grown in western Canada. The purpose of the initial studies, begun in 1999, was to provide a foundation of knowledge that would direct further research into this plant, its management and use.

The conclusions of these tests identified the ability of Kura clover to persist in Alberta, and to be used under a variety of management strategies (Walker, M. Sc. Thesis, 2002). Annual yield was similar under a range of defoliation intensities. Quality analysis revealed that Kura clover had a high protein content, and low ADF and NDF values. Planting Kura clover with Kentucky bluegrass increased the digestibility and feed value, compared to a pure grass stand.

While several promising characteristics of Kura clover were identified, these preliminary studies also revealed two major drawbacks that would need to be overcome if Kura clover was to become a viable option for pastures in Alberta. My PhD research was designed to address these two limitations; the first being seed production of Kura clover in Alberta, and the second, establishment with high yielding grass species, particularly meadow bromegrass and orchard grass. The development of the 5 research experiments followed.

There is very limited information available on management of Kura clover grown for seed, particularly pre-harvest management. In 2002, a test was initiated to compare seed yield of two cultivars of Kura clover over a range of seeding rates and row spacings. In 2003, other experiments followed.

It is known that cover crops can have negative effects on an under-seeded perennial. We compared a range of cover crops to determine the subsequent effect on seed yield of Kura clover. For this test, we used Cossack, a cultivar developed in the United States and the most readily available for purchase.

Kura clover has slow seedling growth, consequently it can be difficult to es
in mixtures with rapidly growing grass species. In order for Kura clover
viable option in pastures, it is necessary that it be a meaningful contrib
mixtures with high-yielding grasses. We examined the relative importance of above and below-ground competition when Kura clover was grown with meadow bromegrass.

Species composition of Kura clover – meadow bromegrass and Kura clover – orchard grass mixtures was compared when the two species were sown at the same time or when planting the grass was delayed.

The survival and growth of Kura clover seedlings was measured following planting in existing grass swards.

These experiments were designed to provide further insight into the challenges currently impeding the adoption of Kura clover for use in Alberta.

Abstract

Kura clover (*Trifolium ambiguum M. Bieb.*) is a perennial legume species has been found to have exceptional persistence in the United States, Aust and New Zealand. There are two challenges that impede the incorporatic Kura clover into pasture mixtures in Alberta. The first is the lack of available seed, and the second is poor establishment success in mixtures with highly competitive grass species. A series of experiments were conducted to (i) address the potential for seed production in a central Alberta environment and (ii) to determine alternative strategies for establishment in mixtures.

Kura clover successfully flowered and produced seed under central Alberta growing conditions. Seed production was greater from the cultivar Endura than Cossack. Kura clover seed production was not affected by row spacing however, yield was greater when clover was planted at 3 or 6 kg/ha versus 9 or 12 kg/ha. Seed yield ranged from 80 kg/ha to 350 kg/ha.

Establishing Kura clover with a cover crop reduced flowering and seed production. Corn (*Zea mays L.*) was the least competitive cover crop, followed by faba bean (*Vicia faba L.*). Canola (*Brassica napus L.*), peas (*Pisum sativum* L.), barley (*Hordeum vulgare L.*) and triticale (*X Tritosecale*) reduced Kura clover seed yield and are not recommended as cover crops.

Comparison of above and below ground competition between Kura clover and meadow bromegrass (*Bromus biebersteinii Rehm.*), indicated that below ground competition has the greatest impact on Kura clover seedling growth.

Altering seeding rate and delaying introduction of the grass species by up to two months significantly improved Kura clover establishment in mixtures.

Kura clover survival in established pastures was higher with physical than chemical sod suppression of the standing forage. Dry matter yield of Kura clover was greatest when defoliated at 6 week intervals.

Challenges still remain regarding seed production and establishment of Kura clover. However, we successfully addressed the major concerns regard potential of Kura clover in Alberta.

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List of Abbreviations

ADF	acid detergent fiber
°Cd	degree Celsius days
F	fall
H	herbicide
ha	hectare
K1	Kura clover – one true leaf
K3	Kura clover – three true leaves
KC	Kura clover
KBG	Kentucky bluegrass
kg	kilogram
MB	meadow bromegrass
NDF	neutral detergent fiber
NH	no herbicide
OG	orchard grass
S	same
SB	smooth bromegrass
SP	spring
wk	week

Chapter 1
Introduction

Forage Research in Alberta

The climate, soil and geography of Alberta are such that a large percentage of the agricultural land is dedicated to the production of grasses and legumes. There are an estimated 30,000 forage producers in Alberta, managing more than twelve million hectares of land in forage and managed range and bush (Collins, 2008). These crops provide the foundation of the beef, equine, sheep and managed wildlife industries. The Alberta forage industry also supports forage processors, suppliers, seed producers and sales companies, managers of rangeland/bush pastures and natural areas, conservation and reclamation organizations, turf grass and apiculture.

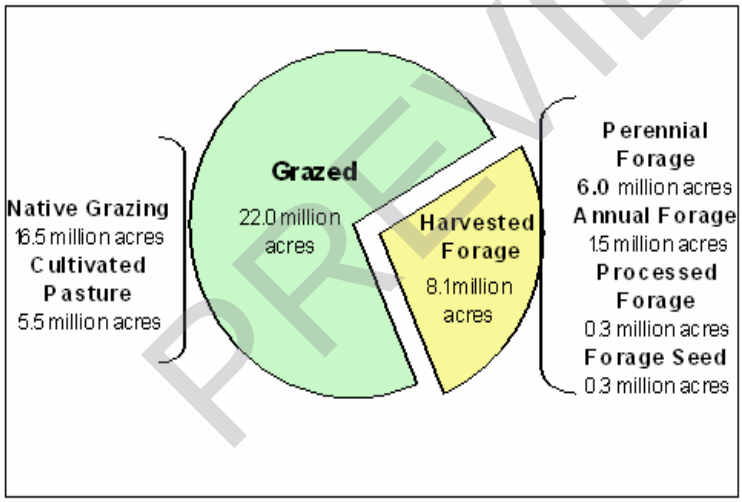

Figure 1-1. Forage Acres by Use in Alberta as reported in 2008 (Collins, 2008).

Over the past fifty years in Central Alberta, the use of native forage species has declined in favor of introduced species. Currently one-third of grazed land in Alberta relies on a large number of cultivated grass and legume species.