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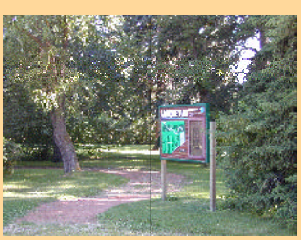
Points of Interest

Since 1980, over 550 articles have been submitted to scientific journals by staff at the Lacombe site of our Centre. This does not include publications submitted by other institutions that included Lacombe scientists as authors.

The arboretum at the Lacombe site is part of the community walking trail system. The first specimens in the arboretum were planted in 1907.



Temperature and Plant Development

In short-season areas, every growing day is important. They literally add up.

Plant growth is minimal at low temperatures, but it generally increases as temperature rises. The rate of plant development will increase to an optimum temperature and after that point growth will decline. The temperature range at which crops grow varies. For instance, wheat will grow at a temperature of 5 °C, but optimizes growth between 20 and 25 °C. Corn is a warm-season crop that requires at least 10 °C for significant growth, and optimizes growth between 30 and 35 °C.

Growing Degree-Days (GDD) and Corn Heat Units (CHU) are two systems that are used to associate temperature and the development of plants and other organisms (i.e. insects).

GDD use the minimum temperature at which each crop will grow as a base temperature. The minimum temperature may be as low as 2.2 °C for spinach and as high as 13 °C for tomatoes. The effect of high temperature on plant growth is ignored in this system.

GDD are calculated by subtracting the base temperature of the crop of interest from the mean daily temperature. If the mean daily temperature is less than the base temperature, a value of 0 is used. The values for each day are then summed over the growing period.

The CHU system is designed specifically for corn. It assumes that no development occurs at night temperatures below 4.4 °C or day temperatures below 10 °C. It uses an optimal growth temperature for corn of 30 °C, and growth declines at temperatures above this point.

The date at which GDD or CHU start accumulating relates to spring planting date for the crop and location of interest. The last day of three consecutive days with mean daily air temperatures greater or equal to 12.8 °C is often used at the start point to accumulate CHU. Frequently the start date is set at May 15. The season ending date is usually the first occurrence of the first fall frost (–2 °C).

Corn heat units are estimated daily, then summed over the growing season using the following equation:

Nighttime relationship | *Daytime relationship*

$$CHU = \frac{(1.8x(T_{min} - 4.4) + 3.3x(T_{max} - 10) - 0.084x(T_{max} - 10)^2)}{2.0}$$

T_{min} = daily minimum temperature (°C)

T_{max} = daily maximum temperature (°C)

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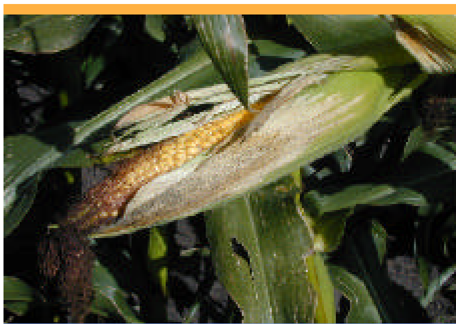

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On a day that the minimum recorded temperature is 14 °C and the maximum temperature is 22 °C, 23 CHU would be recorded. The number of degree-day units would be 8, using a 10 °C as the base temperature.

Equations have been developed to convert between GDD and CHU. The conversions are accurate enough to allow comparison of corn maturity ratings in the northern US and Canada.

To convert CHU into GDD use the following equation:

$GDD = -435.6 + (0.567 \times CHU)$

To convert GDD into CHU use:

$CHU = 768.7 + (1.765 \times GDD)$

Written by Ann de St. Remy & Vern Baron.

Weed Populations Affected by Grazing Intensity

Of the 700,000 ha of pasture in the Aspen Parkland vegetation zone of Alberta, most have been seeded to non-native forage species. The life of these pasture stands in rotation with small grains is 5 to 9 years. A major factor determining the life of a stand is the level of weed infestation.

Forage crops, in general, can reduce weed populations, but few studies report the effects of animal grazing on the ability of forage crops to compete with weeds.

Weed populations in perennial (smooth bromegrass, meadow bromegrass) and annual forage (spring-seeded winter triticale and barley) pastures were subject to 3 levels of grazing intensity over a 4-year period.

The two most common weed species were sheperd's purse (*Capsella bursa-pastoris* (L.) Medik.) and dandelion (*Taraxacum officinale* Weber).

Each unit increase in grazing intensity resulted in 51 more shepherd's purse and 4 more dandelion / m^2 in the perennial pastures. Intensive grazing resulted in excessive defoliation which diminished the ability of the forage crop to recover, and left resources (i.e. light, space) for weeds to establish and grow.

Sheperd's purse and other species were most abundant in the annual pastures. However, MCPA application and the tillage used for seedbed preparation and seeding restricted weed populations shifts in response to grazing pressure.

It was evident that annual pasture systems can withstand higher levels of grazing without long-term effects on the weed population. Grazing must be more closely managed on perennial forages where over grazing can reduce the ability of the forage crop to compete with weeds.

Written by Neil Harker. Further details can be found in *Weed Science* 2000 Vol. 48 Pages 231-238.

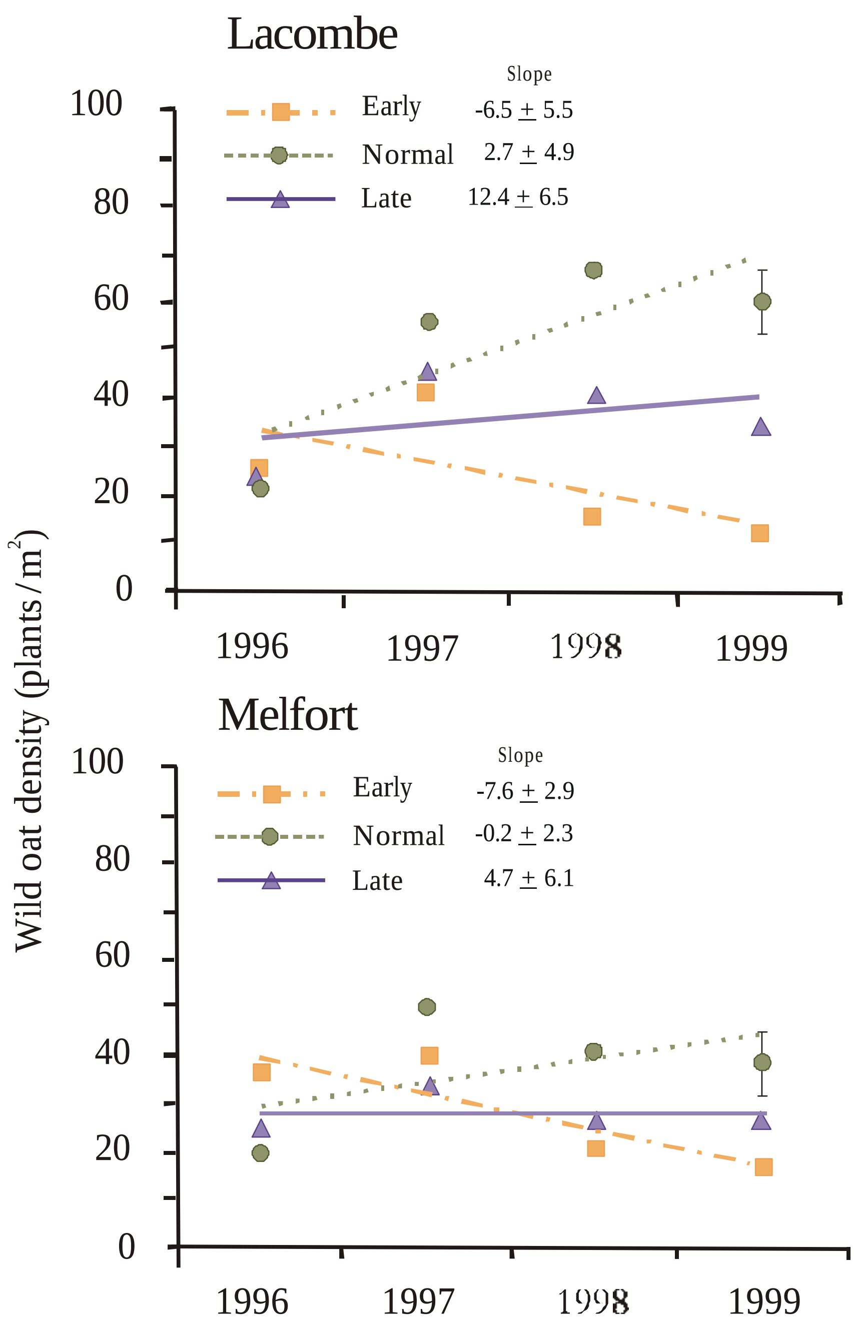
	Mean Grazings per Year	Grazing Height (cm)		Residue After Grazing (tons/ha)
		Initiated	Terminated	
Perennials				
High	7	13	6	0.89
Medium	5	17	5	1.71
Low	3	26	7	2.57
Annuals				
High	4	11	3	0.91
Medium	4	12	4	1.22
Low	2	21	6	2.23

Managing Wild Oat with Barley Silage

A study was conducted under zero tillage conditions to assess the influence of barley silage cutting time on wild oat populations at Lacombe, Alberta and Melfort, Saskatchewan from 1996 to 1999.

Wild oat populations were compared in barley cut shortly after heading (early), 2 weeks later (normal), and at maturity (grain). The same treatments were applied to plots year after year until the end of the study.

Silage dry matter reductions due to early cutting averaged 5%. Wild oat populations decreased in silage plots cut early and increased in grain plots (see Figure below). Reductions were more distinct at Lacombe where phenological differences and barley moisture contents between early- and normal-cut silage were greater than at Melfort.



Half rates of wild oat herbicides (imazamethabenz or tralkoxydim) did not enhance reductions in wild oat populations after early-cut silage, but were often beneficial in normal-cut silage and in barley harvested as grain. Full rates of wild oat herbicides provided a similar level of wild oat control as early-cut silage without herbicides.

The implications of this study are that wild oat populations can be managed in barley silage without the economic, environmental, and health risks associated with herbicides. In addition, herbicide resistance can also be avoided / managed in early-cut silage given the absence of selection pressure for resistant biotypes.

Written by Neil Harker.

WE'RE ON THE WEB!
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CHU Comment

Corn heat units (CHU) will vary greatly with latitude, elevation as well as soil type and slope of the land. So from year to year CHU, even at the same location, can vary widely. Provinces that provide CHU maps for corn-growing areas, usually provide CHU adjustments so a producer can select the level of risk of maturing a corn crop that they are willing to take. Corn varieties are then selected according to the producer's choice. Less risk means selecting a variety that will mature with fewer CHU but may have lower yield potential.

The earliest grain corn hybrids require 2,200 to 2,400 CHU to reach maturity (usually 32% kernel moisture). While corn grown for silage, requires 200 CHU less than the CHU rating for grain corn.

On average, Lacombe receives about 1800 CHU (roughly between May 1 and September 15). This means corn production for silage and for grain is marginal since the earliest corn hybrids are in the 2000 CHU maturity rating.

However, temperatures are gradually increasing because of global warming or other natural phenomenon that result in temperature variation. From 1993 until 2000, CHU at Lacombe have ranged from 1790 to 2500, with CHU greater than 2000 five times, and greater than 1800, six times. With temperatures gradually increasing, and maturity ratings for corn declining, corn may be grown sucessfully in central and northern Alberta sooner than you think.

Corn Heat Unit Ratings for Some Shorter-Season Grain and Fodder Corn Varieties

CanaMaize	2000	DeKalb DKC26–75	2200
Pioneer 39NO3	2000	DeKalb DKC26-82	2200
Pride K080	2125	Novartis N03-D9	2200
Pickseed 2255	2150	Pioneer 39K72	2225
Pioneer 39K72	2150	Pioneer 39W54	2225
Novartis G-4011	2150	DeKalb 220	2250
Interstate 107	2200	DeKalb DKC27-11	2250
Pickseed 2338	2200	HT DynaGro GS52	2250
Pickseed 2363	2200	Hyland HL2017	2250
Garst 8985	2200	Pioneer 39T68	2250

Written by Vern Baron & Ann de St. Remy.

Edited, designed and produced by E.A. de St. Remy