

National Industrial Hemp Variety Evaluation Trials
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Partners

- Canadian Hemp Trade Alliance (CHTA)
- Inno-Tech Alberta
- Manitoba Agriculture (MA)
- Yellowhead County (YC)
- Brazeau County (BC)
- University of Alberta, Breton Plots (UofA)

Background

Originating from Central Asia, industrial hemp (*Cannabis sativa* L.) arrived in eastern Canada with European settlers early in the 17th century. For the next 300 years, hemp was cultivated for food and fibre across the country, including Alberta. However, in 1938 the Opium and Narcotic Act banned the cultivation, possession and processing of hemp in North America. In 1994, Canada began to issue research licences to grow industrial hemp on an experimental basis (Figure 1) and in 1998, the commercial production of industrial hemp was legalized in Canada with Health Canada being the authority to grant licences. (*Adopted from Website: agriculture.alberta.ca / Industrial Hemp Enterprise*).

Due to hemp being classified taxonomically as *Cannabis sativa*, Canada's hemp production is regulated by Health Canada, which means producers and manufacturers who want to work with hemp must obtain licenses from Health Canada in Ottawa. Health Canada license forms and information are located online and producers are only allowed to plant certified seed – there is no “common” seed. All hemp planted must be an approved variety, all of which have less than 0.3% THC content in them in field production. (*Adopted from © 2019 CHTA. All Rights Reserved*)

West-Central Forage Association (WCFA) conducted one of the sites that participated with the National Industrial Hemp Variety Evaluation Trials led by the Canadian Hemp Trade Alliance (CHTA). This research evaluated the performance of 11 hemp varieties.

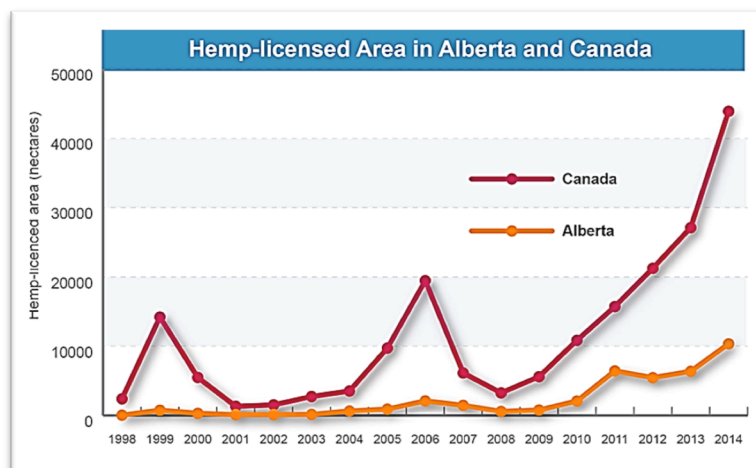


Figure 1. Hemp-licensed area (hectares) in Alberta and Canada (1998 – 2014). Source: Health Canada

Industrial hemp description

Hemp is an annual broadleaf plant with a taproot. It generally requires 110 days for its growth and should receive around 10-12 inches (25.4 - 30.5 cm) of rainfall throughout the growing season. Soil moisture will affect the ability of the root to penetrate deep into the soil profile, and can demonstrate adaptations to a variety of soil moisture conditions. In some soils the taproot may penetrate 6-12 inches (15 - 30 cm) deep.

Trial objective

Determine dry matter yield and quality on 6 grain type and 5 dual-purpose type hemp varieties.

Methodology

A pre-seed tank mix herbicide application was applied (Roundup WeatherMAX © + 2, 4-D Ester 700 ©) on May 28, 2018. Plots were seeded at the Yellowhead County (YC) site, on June 7, 2018 and at the Brazeau County (BC) site, on June 8, 2018 with a small plot Fabro disc drill in 5 rows at 22.5cm spacing (9 meters long by 1.14 meters wide). Four replications of each variety were seeded in complete randomized block design to ¼ inches depth with a soil temperature of 15°C. Soil testing was done and used to prescribe fertilizer applications. Emergence happened around June 18 despite the nominal weed pressure, (Picture 1). Hail damage occurred on July 19th with a small set back on all varieties when the plant growth was at least 4 ft tall (Picture 2).

Data collection of height (cm), lodging (visual scale of 1-5 with 1 erect, 3 at 45 degree angle and 5 flat on the ground), and disease (photos) and male/females plant counts was conducted in August. Fiber yield was collected on September 9th, by cutting 1m² from plots 3 inches from the ground, and grain yield was collected on September 17th, by harvesting heads by hand from the middle rows for a minimum of 1m² of plot. These heads were then dried and threshed with a stationary thresher.



Picture 1. – Emergence June 8, 2018, Hemp Variety Trial, Brazeau County.



Picture 2. – 3 week stem elongation July 17, 2018, (4 ft approximately) Hemp Variety Trial, Brazeau County.

Varieties

The seed was distributed and coordinated by Craig Linde, Diversification Specialist with (Manitoba Agriculture). See Table 1

Type	Variety
Dual-purpose	Joey
Dual-purpose	Canda
Dual-purpose	CRS-1
Dual-purpose	Altair
Dual-purpose	Silesia
Dual-purpose	Anka
Grain	Grandi
Grain	CRS-1
Grain	Katani
Grain	X59
Grain	CFX-2

Table 1. - 2018 Hemp Variety Trial, six double purpose and five grain industrial hemp varieties.

Discussion: Hemp can be dioecious (separate male and female plants), which is its most common type, as well as hermaphroditic or monoecious (male and female flowers on same plant). Plant counts were performed one week before grain and fiber harvest by counting 9 meters of one row on each plot and variety, average was estimated.

Fiber Production: The male plants die after pollinating, causing uneven maturity and varying fibre quality. Plant breeders in Europe have developed hermaphrodite varieties, which are more desirable for fibre production. Evidently higher hermaphrodite plants were found on the dual-purpose varieties with 41 % , versus 0 % found in the grain varieties (See Charts 1 and 2 below).

Grain production: Male plants tend to flower and die earlier than female plants, and so to minimize the impact of this on production, many cultivars are bred to be monoecious. This results in plants that are mostly females (a small percentage of male plants are included for pollination) which allows for more seed to be harvested (since male plants do not set seed) and greater fiber production (since male plants die after flowering). Therefore Chart 2 showed greater amount of females at 56 % and smaller amount of male plants at 44 %, with 0% hermaphrodite plants occurring.

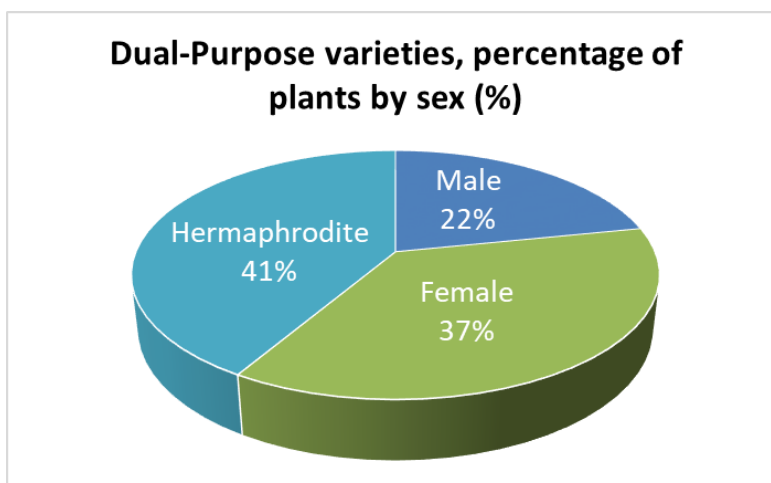


Chart 1. – 2018 Hemp Variety trial. WCFA Brazeau County, Plant counts by sex. Dual-Purpose varieties.

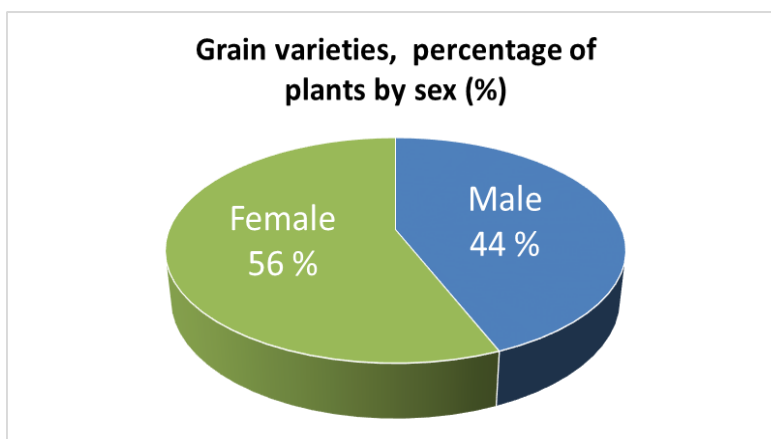
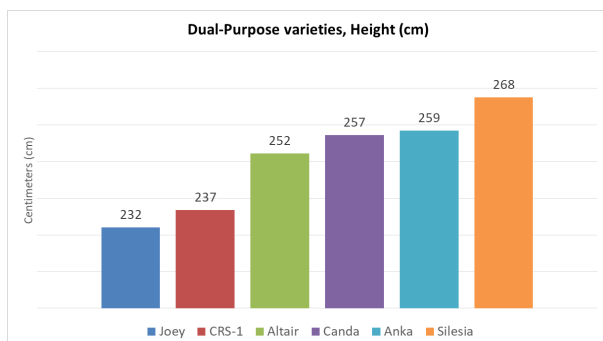
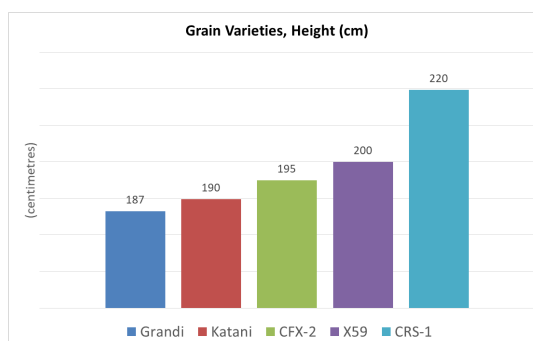


Chart 2. – 2018 Hemp Variety trial. WCFA Brazeau County. Plant counts by sex. Grain varieties.

Plant height: The average of 5 height measurements (from each plot) from ground to top of inflorescence one week prior to harvest was taken. Graphs 3 and 4 showed that dual-purpose varieties measure the highest plant height when compared with grain varieties.



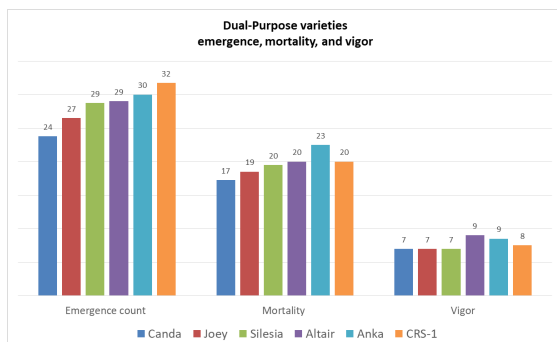
Graph 3. – 2018 Hemp Variety trial. Heights, Dual Purpose.



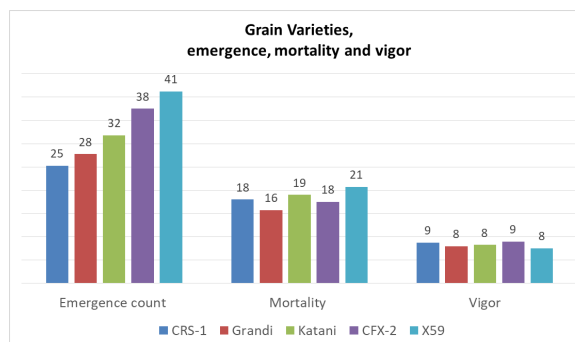
Graph 4. – 2018 Hemp Variety trial. Heights, Grain.

Plant Counts, Mortality, and Vigor

Emergent counts were collected on June 18th, at which point 50% of targeted plants have emerged (or 35 plants/m²). Mortality counts were performed at full emergence and again 3 weeks later at stem elongation (0.25m²). Vigor was determined visually with a scale of 1 to 10, (With 10 being the highest).



Graph 5. – 2018 Hemp Variety trial. Heights, Dual Purpose.

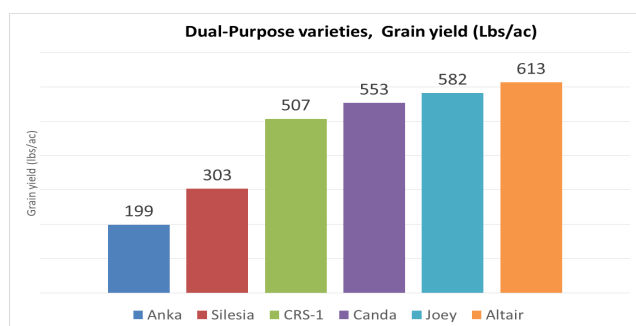


Graph 6. – 2018 Hemp Variety trial. Heights, Grain.

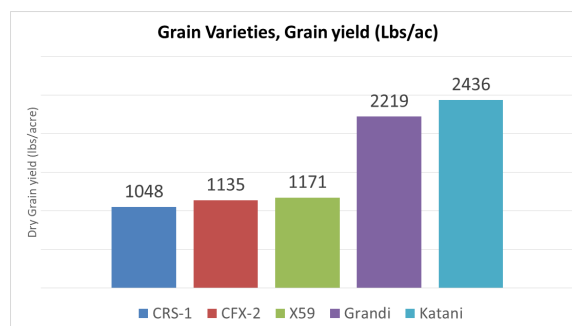
Grain Yield

It's recommended that seed be harvested when seed moisture is between 10-20% moisture, or when 70% of seeds are ripe (bracts have dried and seed is exposed). In Alberta, hemp grain yields from research plots have been found to vary from 200 to 1,600 lbs. per acre (220 to 1,800 kg/ha). The expected yield would likely average nearly 760 lbs. per acre (850 kg/ha) (*Industrial Hemp Enterprise, Website: agriculture.alberta.ca, March 2017*).

Seed heads were harvested by hand with a 1 square meter 1m², then dried and threshed with a stationary thresher. A higher yield showed on grain varieties, with 26% of the total grain yield coming from dual-purpose varieties and 74 % from grain varieties (See Chart 3).



Graph 7. – 2018 Hemp Variety trial. Heights, Dual Purpose.



Graph 8. – 2018 Hemp Variety trial. Heights, Grain.

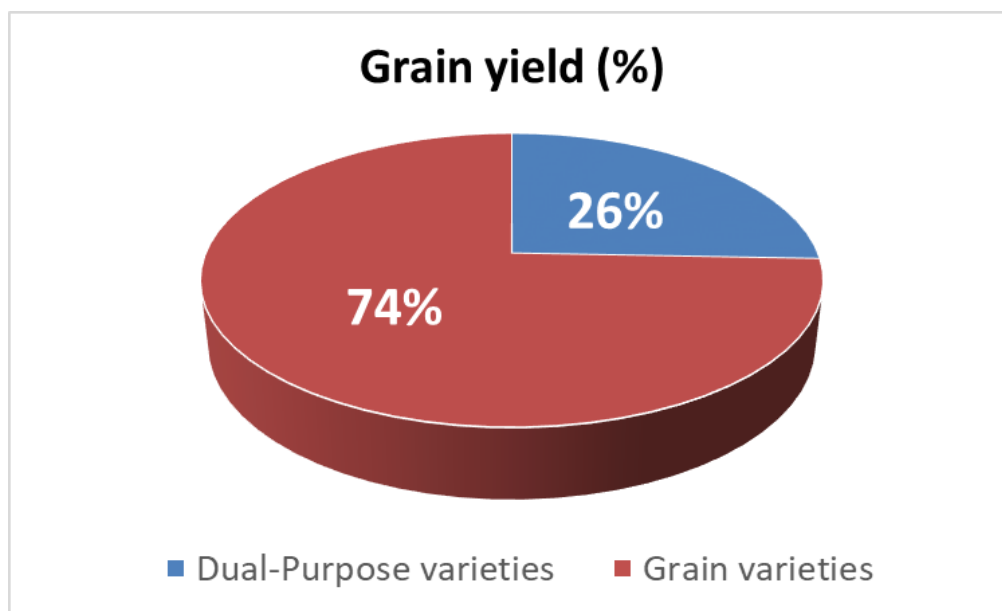


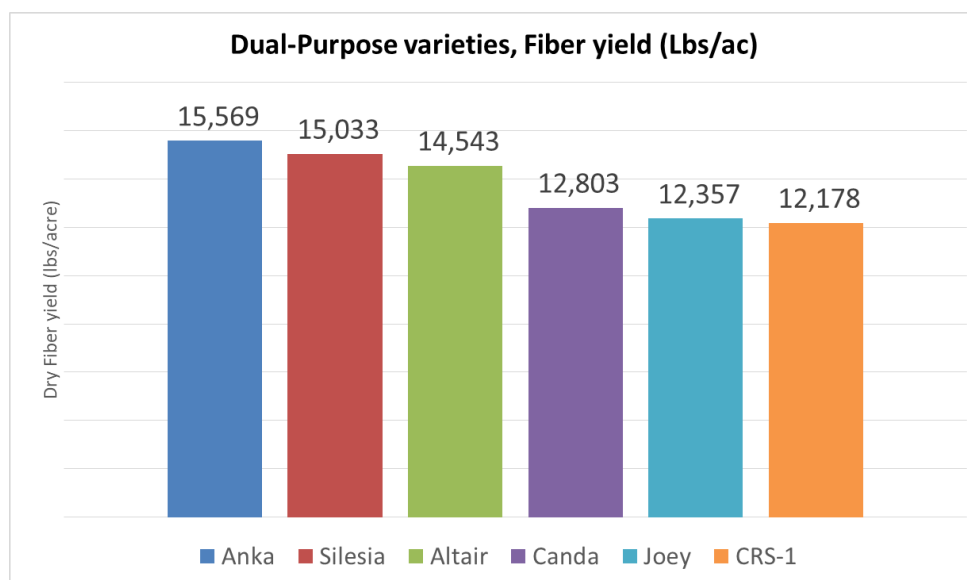
Chart 3. – 2018 Hemp Variety trial. WCFA Brazeau County.
Grain yields percentage of the total grain yield by variety type.

Fiber yield

Hemp grown for fibre can be harvested as a fibre only crop, or a dual grain and fibre crop. In a dual-purpose scenario, stalk yield estimates are 0.75 to 1.5 tonnes/acre. In crops grown and managed solely for fibre, average yields of 2.5 to 3 tonnes/acre are expected with a range from 1 to 6 tonnes per acre (*Agriculture Industrial Hemp Production and Management, Website: manitoba.ca*).

Plant population and variety have a direct effect on grain and fibre yields, and grain yields have a high potential at low plant populations. Fibre yields however require a denser plant population to achieve maximum yield potential and to reach target stem diameter.

Samples were collected from only the dual-purpose varieties. A 1m² sample of plants was removed from plots 3 inches from the ground. The side branches and heads were removed and dried (pictured below). The highest yielding variety was Anka with 15,569 lbs/acre (7.06 tonnes/acre) and the lowest yielding variety was CRS-1 with 12,178 lbs/acre (5.52 tonnes/acre) (Graph 10).



Graph 10. – 2018 Hemp Variety trial. WCFA Brazeau County. Fiber yield (pounds per acre).

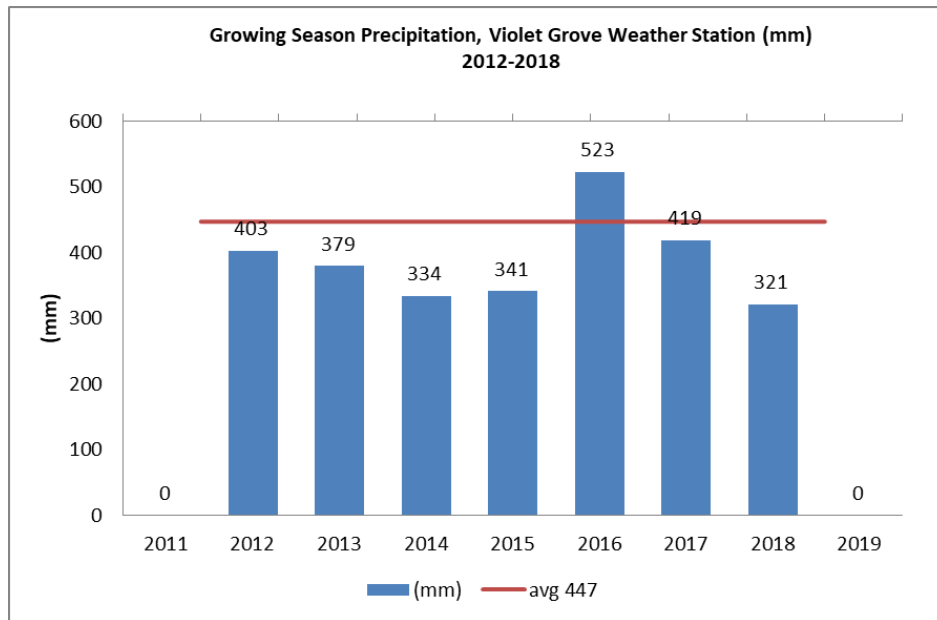


Pictures taken on August 20th. Left-.1 square meter. Middle. - Biomass collection from the sample.

Right. - Collecting wet weight from sample.

Environmental Conditions

Historical annual total precipitation of the gray wooded soil zone from 1971 to 2000 was 526mm (20.70 inches) on average. The growing season precipitation (May until October) is 447mm on average, shown as the “red line” (Alberta Weather Data Viewer, 2016). The total precipitation in Violet Grove was 321 mm (12.6 inches) (Graphic 4).



Graphic 6. – Growing season precipitation for the Violet Grove weather station, 2012 to 2018 at Brazeau County



Picture 4. – 2018 Hemp Variety trial. WCFA Brazeau County. Male plants (yellow)



Pictures from the site on different dates. – July 1st (left) vs. September 9th (right).



Pictures of Grandi grain variety on 2 different dates. August (left) and September (right)



2018 WCFA Research Plot Tour and Producer Walk