

12.0 Industrial hemp grain and fibre variety evaluation

Project duration: ongoing

Collaborators: Canadian Hemp Trade Alliance

Objectives

To evaluate grain and fibre yield obtained from different hemp varieties in different agro-ecological regions of Canada.

Background

The Canadian Hemp Trade Alliance (CHTA) is a not-for-profit organization which represents over 260 growers across all 10 provinces as well as numerous processors, distributors, developers and researchers involved in Canada's rapidly growing industrial hemp industry.

Canada started issuing licenses to allow research on industrial hemp in 1994 and new regulations were included in the Canadian Controlled Drugs and Substances Act in 1998 to authorize commercial production of hemp under licensing and control of Health Canada (Cherney and Small, 2016). In Canada, hemp production is more concentrated in Southern Ontario and Quebec but recently, there have been more interest across many provinces as demand for the crop is increasing. The major increase in demand for hemp can be attributed to its many uses, among them; fibre, oilseed and its use in the pharmaceutical industry (De Meijer, 2014; Kaiser et al., 2015). Hemp fiber has high tensile strength and is useful for plastic bio-composites for vehicles, textile, rope, insulation, paper, absorbent and bedding material (Darby et al., 2017). An increase in the interest for production of industrial hemp also means that there is need for producers to effectively select varieties that can perform best in their areas of production. Therefore, there is need for testing available varieties in different agro-ecological regions in order help producers make better decisions. This study seeks to evaluate performance of hemp varieties in relation to grain or fibre yield in varying environmental conditions.

Materials and Methods

The trials were located at Melita, Roblin, Arborg and Carberry in Manitoba. Melita location was established on oat stubble under no till system. The trial was arranged as randomized complete block design with 9 treatments (6 grain and 3 dual purpose varieties) replicated 4 times. Apart from grain and fibre yield, other data collected included; plant counts at 100 % emergence and stem elongation, plant height at maturity, lodging, plant vigor rating, proportion of male to female plants and days to maturity.

Fertility regime and other agronomics related to industrial hemp research at Melita are presented in Table 12a.

Table 12a. Melita site characterization and agronomic practices in 2019

Fertility	N	P	K	S
	lbs/ac			
Soil Test (0-24")	30	8	600	190
Applied	121	35	7	2

Soil Type	Waskada Loam
Legal Land Location	NW 7-4-26 W1
Burnoff	May 23 0.75 L/ac Roundup
Seed Date	May 23 rd
Depth	0.75"
Herbicides Used	Select @ 150ml/ac on 13 June Koril 0.4L/ac spot sprayed on 18 June
Harvest Date Fibre	16 Sep 2019
Harvest Date Grain	17 Sep 2019

Results and Discussion

Hemp fibre yield for trials D and G in Melita were highly variable with coefficient of variation of 21 and 22.7%. In trial D, Petera variety yielded over 3100 kg ha⁻¹ of fibre more than CRS-1 and Altair. In trial G, there were 6 hemp varieties with fibre yield ranging from 5801 kg ha⁻¹ (Judy) to 8960 kg ha⁻¹ (Grandi) (Table 12b). Hemp trials in Melita faced a challenge with respect to fusarium wilt and bird damage that was prevalent and could have resulted in reduced yields.

Table 12b. Industrial Hemp fibre yield obtained from Melita (MB) in 2019

Variety>>	Petera	CRS-1	Altair				C.V	S.E	F.Value	L.S.D
Yield_trial D (kg ha ⁻¹)	11498	8701	8960				21.0	537.5	3.9	2044.1
Variety>>	X59	Judy	CRS-1	Katani	Grandi	CFX-2	C.V	S.E	F.Value	L.S.D
Yield_trial G (kg ha ⁻¹)	8753	8960	7924	6629	5801	7251	22.7	416.1	2.4	2662.1

On average, Altair and Petera varieties yielded significantly more hemp fibre compared to CRS-1 (Table 12c). The lowest CRS-1 fibre yield of 1150 kg ha⁻¹ was observed at Cobden in Ontario while the highest fibre yield of 15365 kg ha⁻¹ was observed at Falher in Alberta for Santhica 70 variety.

Table 12c. Analysis of Variance for Trial D industrial hemp fibre yield obtained from Arborg (MB), Lethbridge (AB), Cobden (ON), St Hugues (QC) and Falher Late (AB)

Name	Arborg MB	Lethbridge AB	Cobden ON	St Hugues QC	Falher Late AB	MEAN
CRS-1	4919b	8029ab	1150c	3075d	-	4293b
Altair	7674a	9704a	1875b	6475b	-	6432a
Petera	7445a	7753ab	2875a	10000a	-	7018a
Silesia	7756a	8910ab	1575b	4800c	10224c	-
Anka	-	7630b	-	-	-	-
Rigel	-	7555b	-	-	-	-
Santhica 27	-	8321ab	-	-	13911ab	-
Santhica 70	-	7943ab	-	-	15365a	-
Earlina	-	-	-	-	9015c	-
C.V	15.9	15.0	12.3	10.8	16.0	9.4
S.E.	276.2	308.3	57.5	163.8	484.1	276.8
L.S.D.	1766.8	1972.7	367.7	1047.9	3097.5	834.3
# stations	1	1	1	1	1	4

There were no significant differences in hemp yield obtained from all varieties at Indian Head. However, at St Hugues, Altair had significantly higher grain yield compared to Petera and CRS-1. Overall, Altair and CRS-1 did not significantly differ in grain yield (Table 12d). Grain yield from St Hugues was close to 3 times higher than that obtained from Indian head probably due to differences in agronomic management as well as weather conditions.

Table 12d. Analysis of Variance for Trial D industrial hemp grain yield obtained from Indian Head (SK) and St Hugues (QC) in 2019

Name	Indian Head SK	St Hugues QC	MEAN
Petera	586a	1459c	1023b
CRS-1	654a	1602bc	1128ab
Altair	680a	2215a	1448a
Silesia	-	2161ab	-
Anka	-	-	-
Rigel	-	-	-
Santhica 27	-	-	-
Santhica 70	-	-	-
Earlina	-	-	-
C.V	13.5	20.0	14.2
S.E.	32.9	92.7	123.1
L.S.D.	157.8	593.3	371.1
# stations	1	1	2

In Trial G, X59 variety ranked 1st in fibre yield at each sites except Lethbridge where it was out yielded by Grandi (Table 12e). Across sites, the highest fibre yield was obtained from X59 but it was not significantly different from Grandi and CRS-1. Furthermore, yield obtained from CFX-2, Katani, CRS-1 and Grandi were not significantly different. Fibre yield from Lethbridge was highly variable compared to other sites.

Table 12e. Analysis of Variance for Trial G industrial hemp fibre yield from Arborg, Indian Head, Lethbridge and Falher in 2019

Name	Arborg MB	Indian Head SK	Lethbridge AB	Falher AB	MEAN
Judy	828c	608bc	468d	728c	658c
CFX-2	1142b	584bc	823abc	1139ab	922b
Katani	1110b	552c	846abc	1235ab	936b
CRS-1	1243ab	700ab	773bc	1143ab	965ab
Grandi	1121b	651bc	975ab	1273ab	1005ab
X59	1390a	793a	751c	1344a	1070a
Earlina	-	-	621 ≠	-	-
C.V	9.0	12.2	17.2	12.6	8.1
S.E.	25.7	20.3	33.2	36.6	37.2
L.S.D.	164.3	129.7	212.1	234.2	112.2
# stations	1	1	1	1	4