

Intercropping: Hemp-Cereal Silage

Project duration: May 2020 – August 2020

Objectives: To evaluate intercrop mixes with hemp for silage production

Collaborators: PCDF, Manitoba Horticulture Productivity Enhancement Centre (MHPEC)

Background

Silage plays an important part in the Manitoba livestock industry. Corn silage provides high yields, relative to barley silage (14 t/ac, over 7.5 t/ac, [2020 Silage Cost of Production](#), MARD). In the Parkland area, the yield for corn silage is variable and many producers opt to produce a cereal silage, such as barley or oat. PCDF and MHPEC have worked together to explore intercropping options for cereals silage.

Hemp provides an interesting opportunity for silage production, due to its high production potential and good nutritional qualities. However, [Canadian regulations](#) currently prohibit the use of hemp products as a livestock feed ingredients in Canada. **As such, this research is purely exploratory, and is not intended to provide recommendations to producers.** PCDF may use the data to provide information to regulatory agencies around the use of hemp in livestock feed.

Results



Figure 1: Clockwise from top-left: (1) hemp-only; (2) barley-hemp; (3) oat-hemp; (4) oat-only; (5) hemp-oat silage, chopped; (6) long fibres from over-ripe hemp plants.

The silage yields (t/ac) for treatments is shown in Figure 2. The results are for one year of data only.

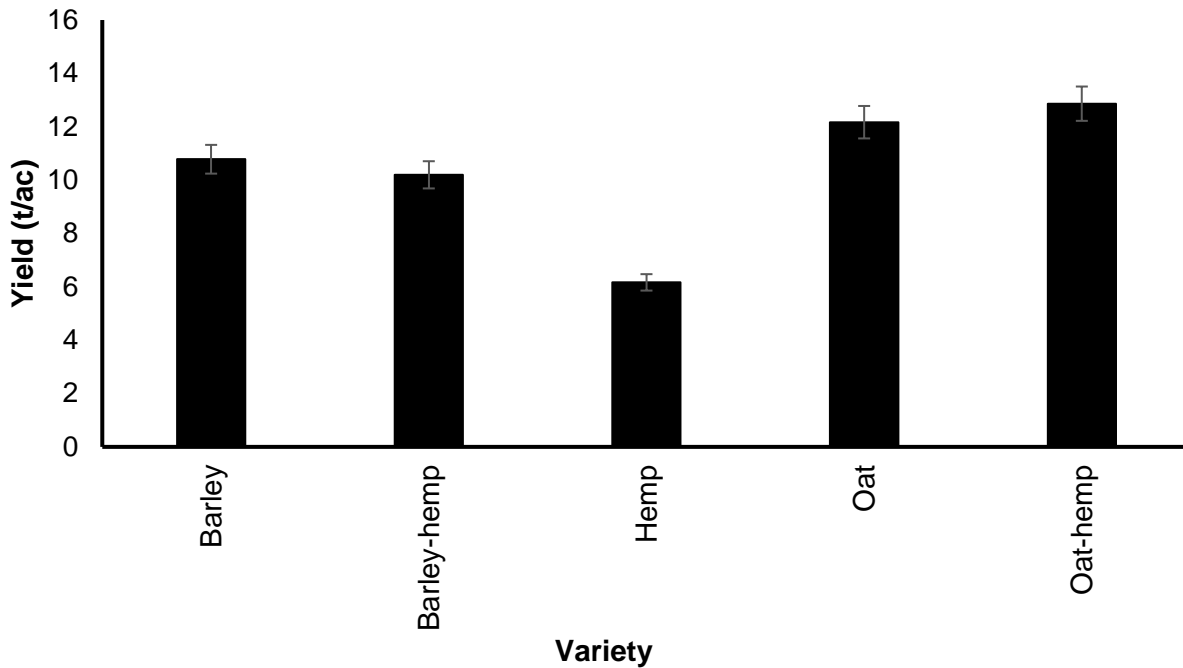


Figure 2: PCDF wet silage yield (t/ac) by treatment; all yields adjusted to 65% moisture.

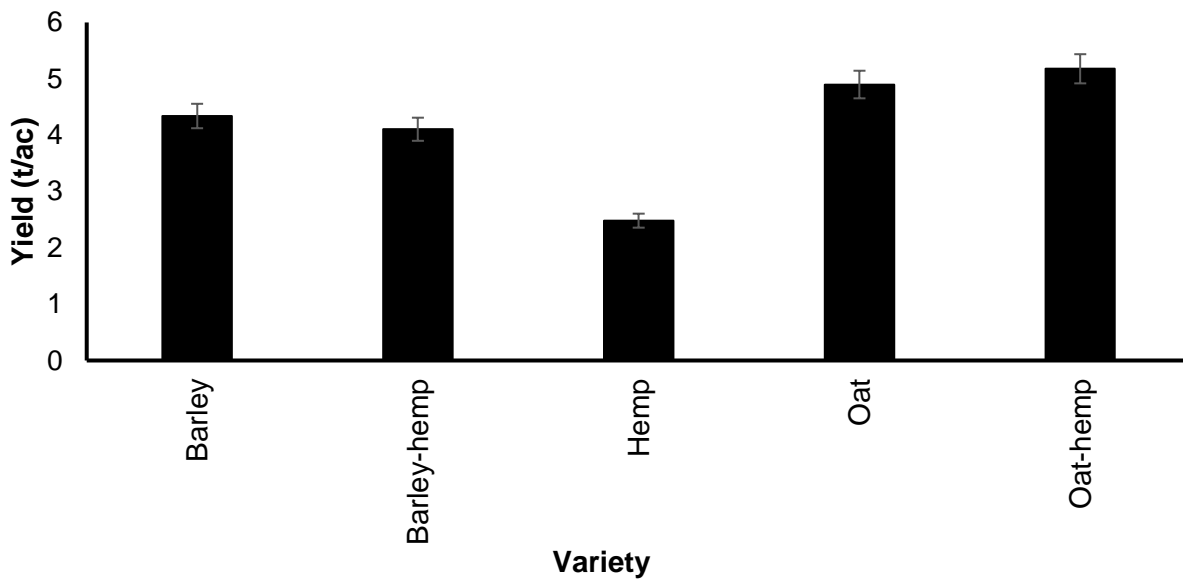


Figure 3: PCDF dry silage yield (t/ac) by treatment; all yield adjusted to 15% (hay) moisture.

The results for silage yield differ statistically by treatment (Table 1). The hemp-only treatment provided significantly lower silage yields than treatments including barley and oat. Further, the inclusion of hemp in the silage mixture did not significantly increase yield over barley-only or oat-only. Note that the reliability of these results is low due to a high percent CV for silage yield. The feed values and mineral content for each treatment are shown in Tables 2 and 3.

Table 1: Summary of statistical information for silage yield

Entry	Silage yield (t/ac) wet yield	Silage yield (t/ac) dry yield	Statistical significance: wet and dry*	
Barley	10.8	8.7	A	
Barley-hemp	10.2	8.2	A	
Oat	12.2	9.8	A	
Oat-hemp	12.9	10.4	A	
Hemp	6.2	5.0		B
CV (%)	27.8			
LSD (0.05)	3.4	2.8		

* Treatments not marked with the same letter are statistically different from other treatments.

Table 2: Feed values for silage by treatment compared to animal feed requirements*

Entry	% Crude Protein	% TDN
Barley	10.14	58.27
Oat	10.80	59.79
Hemp	12.58	43.70
Barley-hemp	12.18	58.69
Oat-hemp	12.22	58.94
Animal feed requirements		
Mature cows		
Mid gestation	7	50-53
Late gestation	9	58
Lactating	11-12	60-65
Replacement heifers	8-10	60-65
Breeding bulls	7-8	48-50
Yearling bulls	7-8	55-60

* Animal feed requirements developed by Elisabeth Nernberg (ARD).

Table 3: Mineral content for silage by treatment

Mineral	Barley	Oat	Hemp	Barley-hemp	Oat-hemp
Ca	0.35	0.28	1.55	0.64	0.38
P	0.19	0.20	0.27	0.24	0.21
Mg	0.12	0.13	0.36	0.18	0.15
Na	0.39	0.49	0.12	0.30	0.47
K	1.25	1.42	1.46	1.29	1.56
Mo	1.29	2.54	1.33	1.13	2.07
Cu	4.23	3.54	7.51	5.35	3.68
Zn	17.30	17.88	23.54	21.34	19.39
Mn	30.24	52.04	64.06	36.88	54.02
Fe	112.85	153.07	151.36	145.81	184.17

There are some herbicides registered for use with hemp, and there are no herbicides registered for both hemp and barley or oats, making silage intercropping for hemp and cereals a challenge. Good weed control prior to seeding is crucial. The trial was hand-weeded.

Table 4: Treatments, seeding rates and costs

Treatments	Percent of each monocrop seeding rate	Seeding Rate (lb/ac)	Cost per acre
Barley (Maverick)	100	90	\$14.91
Oat (Haymaker)	100	90	\$19.72
Hemp (Katani)	100	25	\$50.00
Barley-hemp (Maverick-Katani)	75-33	68-8	\$27.26
Oat-hemp (Haymaker-Katani)	75-33	68-8	\$30.90

Observations

The silage was prepared by running the harvested material from each plot through a plant shredder (see Figure 1.5). Hemp is a plant with long fibres that become tougher towards maturity. If the crop becomes too mature, these fibres have the potential to tangle in the chopping equipment. Further, the higher fiber content makes for lower digestibility by livestock. This is reflected in the lower percent-TDN figure for the hemp-only treatment (Table 2). Nevertheless, even a reduced rate of hemp appeared to positively increase percent-protein content for the oat-hemp and barley-hemp treatments.

Materials and methods

Experimental Design: Random Complete Block Design
 Entries: 5 (3 replications)
 Seeding: May 25
 Harvest: Aug 12

Data collected Date Collected
 Hemp Emergence: May 28 – Jun 7
 Cereal Emergence: May 25 – Jun 6
 % Overall Emergence: Jul 11-18
 Plot Wet Weight: Aug 12
 Plot Dry Weight: Sep 12

Agronomic info

Previous year’s crop: Barley Silage
 Soil Type: Erickson Loam Clay
 Landscape: Rolling with trees to the east
 Seedbed preparation: Heavy harrowed

Table 5: Fertility Information

	Available	Added	Type
N	79 lb/ac	47 lb/ac	46-0-0
P	22 ppm	10 lb/ac	11-52-0-0
K	257 ppm		