

Cover Crop Species Evaluation

Project duration: May 2020 – August 2020

Objectives: To identify the biomass and nutritional contributions of cover crop species to a pea-oat mixture.

Collaborators: PCDF

Background

The use of cover crops is gaining popularity among Manitoba farmers. The Manitoba Agriculture and Resource Development (ARD) [website](#) provides information on the many benefits to growing cover crops. Previous research at PCDF has examined the benefits of growing a green manure mixture that included cover crops for use with livestock grazing (see “The Effect of Grazing and Non-grazing of Annual Green Manures on Following Crops - Year 2”). A question arising from that research is how specific cover crop species contribute to the green manure mixture, both in terms of biomass and nutritional properties. This trial examined the biomass and nutritional contributions of different cover crop species to a pea-oat mixture. Biomass yield was taken from each plot, and a composite sample for each treatment was submitted for a feed test. Additionally, pea-oat grain yield was calculated for each plot.

Results

The average wet and dry biomass yield (t/ac) for each treatment is shown in Figure 1. The treatments, with seeding rates, are presented in Table 1.

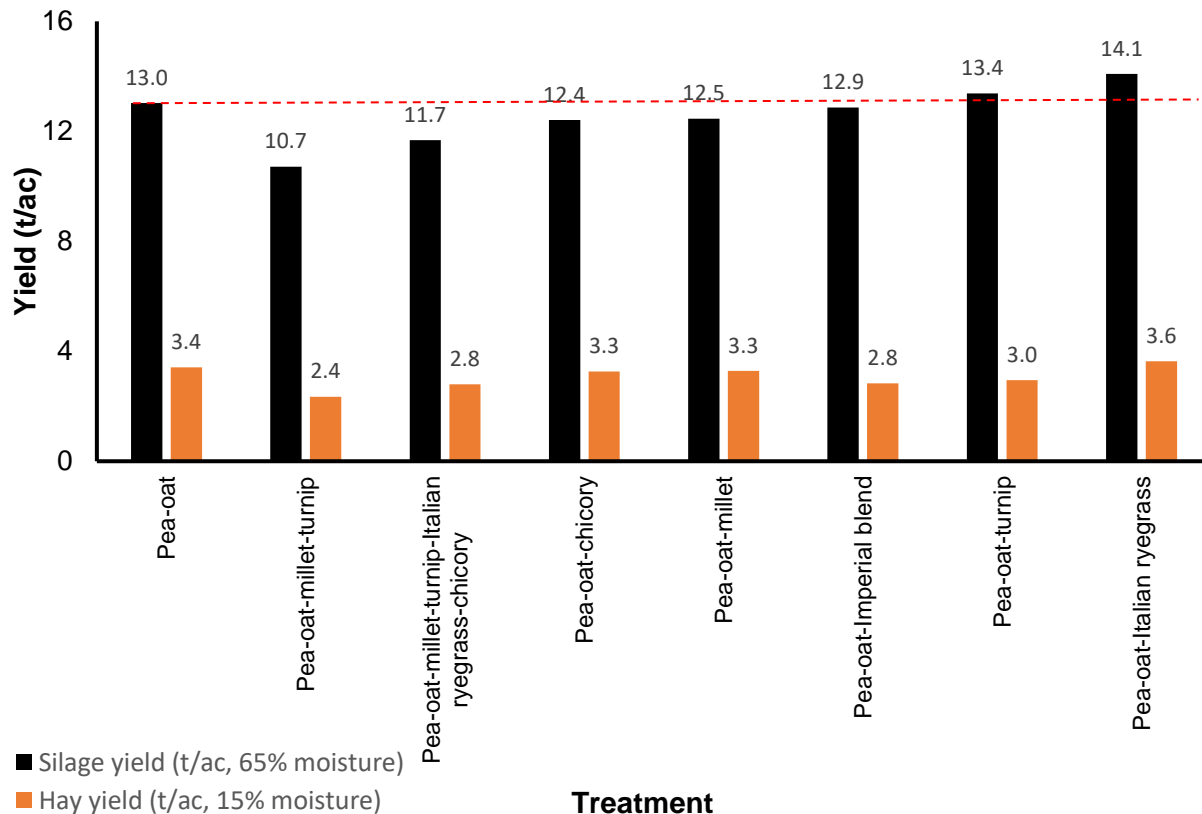


Figure 1: Biomass yield, silage (65% moisture, t/ac) and hay (15% moisture, t/ac), by treatment (red dashed line shows pea-oat only yield for comparison)

Table 1: Treatment seeding rates

Treatment	lbs per acre							\$/acre
	Pea	Oat	Millet	Turnip	Italian ryegrass	Chicory	Blend	
Pea-Oat*	40	30						15.35
Pea-Oat-Millet	40	30	6					26.09
Pea-Oat-Turnip	40	30		3				29.75
Pea-Oat-Italian Ryegrass	40	30			5			26.30
Pea-Oat-Chicory	40	30				3		44.09
Pea-Oat-Millet-Turnip	40	30	6	3				40.49
Pea-Oat-Millet-Turnip-Italian Ryegrass-Chicory	40	30	6	3	2	1		54.45
Pea-Oat-Blend**	40	30					11	51.98

* Pea = 4010 Forage, Oat = Haymaker

** Blend = millet, Italian ryegrass, Persian clover, chicory, turnip, feed beet, common vetch, phacelia

The feed values for each treatment are shown in Table 2.

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

Entry	% Crude Protein	% TDN	Ca	P	Mg	K
Pea-Oat	11.22	59.40	0.54	0.23	0.21	2.19
Pea-Oat-Millet	10.32	60.30	0.41	0.25	0.18	2.21
Pea-Oat-Turnip	11.73	61.79	0.56	0.25	0.19	2.25
Pea-Oat-Italian Ryegrass	9.89	62.47	0.44	0.25	0.17	2.18
Pea-Oat-Chicory	9.99	62.43	0.37	0.25	0.16	2.19
Pea-Oat-Millet-Turnip	10.61	59.47	0.44	0.25	0.18	2.24
Pea-Oat-Millet-Turnip-Italian Ryegrass-Chicory	11.00	62.06	0.52	0.26	0.19	2.30
Pea-Oat-Blend	10.37	76.23	0.45	0.25	0.17	2.35
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).

Oat and pea grain yield for each treatment is shown in Table 3.

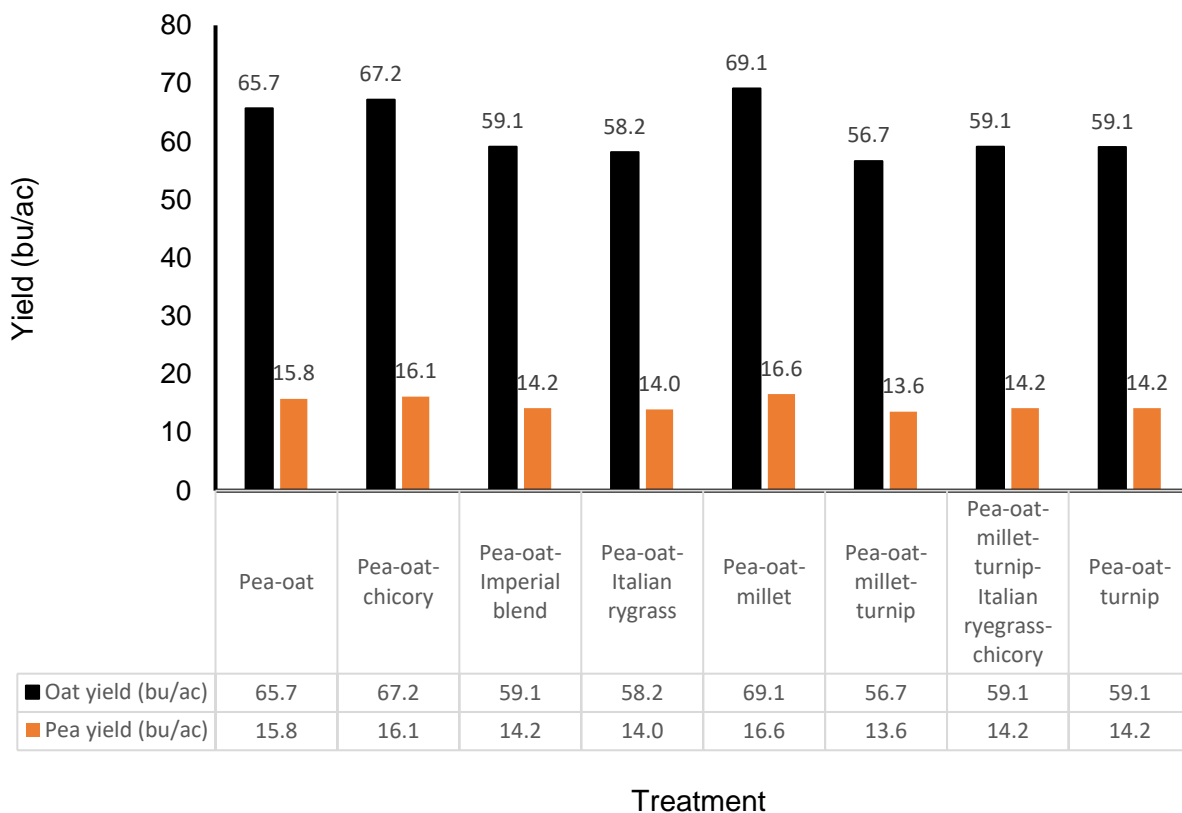


Figure 2: Grain yield (bu/ac) for oat and pea by treatment

The statistical information for biomass yield and grain yield are summarized in Table 3.

Table 3: Summary of statistical information for biomass yield and grain yield.

Treatment	Biomass Yield		Statistical Significance (Biomass, Silage and Hay)*	Oat yield (bu/ac)	Pea yield (bu/ac)	Statistical Significance (Oat and Pea Yield)*		
	Silage (t/ac)	Dry hay (t/ac)						
Pea-Oat	13.0	3.4	A	65.7	15.8	A		
Pea-Oat-Millet	12.5	3.3	A	69.1	16.6	A	B	
Pea-Oat-Turnip	13.4	3.0	A	59.1	14.2	A	B	C
Pea-Oat-Italian Rygrass	14.1	3.6	A	58.2	14.0		B	C
Pea-Oat-Chicory	12.4	3.3	A	67.2	16.1		B	C
Pea-Oat-Millet-Turnip	10.7	2.4	A	56.7	13.6		B	C
Pea-Oat-Millet-Turnip-Italian Rygrass-Chicory	11.7	2.8	A	59.1	14.2			C
Pea-Oat-Blend	12.9	2.8	A	59.1	14.2			D
CV (%)	16.0			9.8	9.8			
LSD (0.05)	3.63			8.23	1.98			

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

Observations

The trial results show that including more cover crop species in a mixture did not significantly affect overall biomass yield for silage or hay. However, feed test values indicate that including leafy cover crop species (especially the blend of millet, Italian ryegrass, Persian clover, chicory, turnip, feed beet, common vetch and phacelia) increases the percentage of total digestible nutrients (%TDN). The increased %TDN is likely the result of the higher proportion of tender, leafy material in the mixture. Including cover crops in a mixture may be useful for producers targeting a high-quality feed ration. However, the overall cost of seed per acre is higher for mixtures including cover crops as compared to the pea-oat only treatment.

An area for further research arising from this study is to look at the potential for establishing cover crops in-season that will provide producers with good grazing or forage opportunities in the following year. For example, chicory does not produce large amounts of biomass in the establishment year, but can be an excellent crop for livestock in future years. The advantages in subsequent years might justify the higher seeding costs in the establishment years.

Materials and methods

Experimental Design: Random Complete Block Design
Entries: 8 Treatments, 3 replications
Seeding: May 25
Harvest: Sep 22

Data collected Date collected
Oat heading date: Jul 18
Pea flowering date: Jul 19 – 23
Vigor: Jul
Stand: Jul
Grain yield: Sep 22
Moisture: Sep 22
Biomass wet weight: Aug 12
Biomass dry weight: Sep 15

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



Figure 3: Pea-oat mixture at oat booting stage

Table 2: Fertility Information

	Available	Added	Type
N	61 lb/ac	-	N/A
P	47 ppm	15 lb/ac	11-52-0-0
K	393 ppm	-	N/A