Can hairy vetch be a worthwhile companion in grain corn & grazing corn strategies, or is it just another big hairy monster?

Scott Chalmers P.Ag., Applied Research Specialist, Manitoba Agriculture

Westman Agricultural Diversification Organization Inc., 139 Main Street, Melita MB R0M 1L0

Introduction

Corn production on the Canadian prairies for both grain and forage has been increasing in recent years. As fertilizer prices increase, the reduction of reliance on synthetic fertilizer inputs is of interest to producers. Additionally, the focus of many producers is shifting to sustainability as they look for ways to protect their crops and soils. Intercropping is becoming a popular option for producers who wish to integrate sustainable systems into their operation, as intercropping has been shown to benefit soil health, reduce pest pressure, and increase residual soil nitrogen content if a legume is included in the intercropping system. Intercropping corn with hairy vetch (*Vicia villosa* Roth) has been shown to provide many benefits to a field, including protection against soil erosion and improved weed control due to hairy vetch's creeping growth habit (Brainard et al., 2012). In addition, nitrogen fixation by hairy vetch may result in reduced expenses on fertilizer, improved potassium availability for subsequent crops, and improved soil biodiversity (Cook et al., 2010; OMAFRA, 2012). Intercropping corn with hairy vetch may provide producers with the opportunity to use the intercrop as cattle feed by either grazing the whole system or removing the corn grain and grazing the corn stubble and vetch. This trial examined the effects of intercropping corn with hairy vetch at various corn seeding rates on corn grain yield, corn biomass, vetch biomass, total field nitrogen derived from biomass, residual soil nitrogen, and feed quantity and quality for cattle grazing.

A small plot trial was grown at Westman Agricultural Diversification Organization (WADO) near Melita to observe these two crops' responses when grown together and to find any good or bad situations with the combination.

References:

Brainard, D., Henshaw, B. and Snapp, S. 2012. Hairy Vetch Varieties and Bi-Cultures Influence Cover Crop Services in Strip-Tilled Sweet Corn. Agronomy Journal 104 (3): 629-638. doi:10.2134/agronj2011.0360

Cook, J. C., Gallagher, R. S., Kaye, J. P., Lynch, J., Bradley, B. 2010. Optimizing Vetch Nitrogen Production and Corn Nitrogen Accumulation Under No-Till Management. Agronomy Journal 102 (5): 1491-1499.

OMAFRA, 2012. Cover Crops: Hairy vetch. www.omafra.gov.on.ca

Objectives

- To determine the effect of hairy vetch on corn grain yield and corn biomass in an intercropping system
- To determine the effect of corn seeding rate on corn yield, corn biomass, and vetch biomass in an intercropping system
- To determine an optimal corn-hairy vetch intercropping system for grain production, cattle production, and field nitrogen economy

Methods

Location Info: NW 6-4-26 W1, near Melita MB
Soil Series: Margaret loamy sand
Previous Crop: Spring Wheat (2020) and Corn (2021)
Crop Years Grown: 2021 & 2022
Rainfall: 286 mm and 149 mm, Normal 337mm
Spring Soil Test:

Year	Depth (in)	pH	OM%	N	P-Olsen	K	Zn	Ca	Mg	Na	S
				ppm							
2021	0-6	8.1	1.6	14.5	8	88	0.49	3252	395	27	12
	6-24	8.5	-	3	-	-	-	-	-	-	32
2022	0-6	8.0	1.1	23	7	124	0.44	3102	157	13	12
	6-24	-	-	39	-	-	-	-	-	-	60

Applied Fertilizer: Banded 150N-50P-65K-23S-1Zn-4Cu-2B actual lbs/ac prior to planting.

Plots were pre-fertilized and air seeded with Seedhawk with hairy vetch at ½" depth prior to planting. Corn planted at 2" depth with a Wintersteiger Dynamic Disc vacuum planter. Plot Size: 2-30" rows x 8 m long.

Design: Two Factor RCBD, 4 replications, GLM two-way ANOVA, post hoc Tukey (95%), Minitab 18.1 stats software.

Factor 1:
Corn Planting Rates 20,000; 26,000 and 32,000 ppa on 30" row spacing
Factor 2:
With/without hairy vetch seeded at 20 lbs/ac inoculated with Nodulator SCG (BASF) on 9.5" row spacing

Varieties: Corn – Dekalb 26-28RR
Hairy vetch –Welter Seeds & Honey Co.

Herbicide Program: Roundup Transorb (540 g a.i./L) applied at 0.5 L/ac at 3 leaf corn/vetch stage at 10 imp. gal/ac. Some tolerant kochia was hand weeded in early July. Vetch is quite tolerant to glyphosate.

Harvest: Wintersteiger Classic Combine with H2 Grain Gauge with EasyHarvest software assisted by a 2 row x 30" Geringhoff corn header

Data Collected:
- Grain Yield, Test Weight, % Moisture
- Total corn biomass, vetch biomass, wet weed biomass
- Composite Feed Tests (2FF, Central Testing Lab)
- Post Harvest Soil Nitrate Tests (AgVise Laboratories), per plot composite depths of 0-6", 6-24"

Results

- Hairy vetch significantly reduced corn biomass by 15% and grain corn yield by 16% but overall did not change total biomass including vetch with or without the grain component. (Figure 1, 2, 3)
- Increases in corn population resulted in higher corn grain yield. (Figure 4)
- Including vetch as a companion in corn reduced wet weed biomass by 61%.

Figure 1. Total Biomass by System (P<0.001)

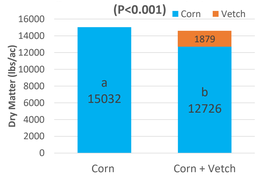


Figure 3. Total Biomass by Population (P=0.624)

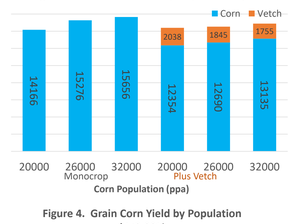


Figure 3. Grain Corn Yield by System (P<0.001)

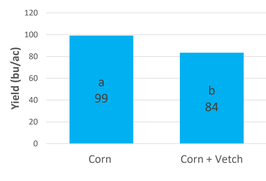
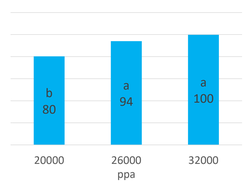


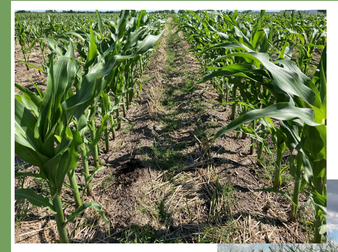
Figure 4. Grain Corn Yield by Population (P<0.001)



- Improvements in feed quality were found in intercrops with increases in crude protein, calcium, phosphorous, potassium, RFV and lower NDF & ADF

Grazing System	Corn Rate plants/ac	ADF	Ca	CP	DE	Mg	Met E	NDF	Phos	Pot	RFV	TDN
Stover without Grain												
	20000	49.75	0.46	4.92	2.01	0.30	1.67	79.16	0.08	1.06	59	45.49
	26000	51.56	0.47	4.71	1.92	0.35	1.60	78.62	0.09	0.81	58	43.55
	32000	51.64	0.54	4.90	1.92	0.37	1.59	78.46	0.08	0.98	58	43.47
Stover plus Grain												
	20000	23.97	0.23	7.85	3.17	0.20	2.64	44.45	0.24	0.79	155	72.01
	26000	23.22	0.17	7.72	3.20	0.19	2.66	40.92	0.24	0.59	166	72.64
	32000	28.10	0.24	6.83	2.95	0.22	2.45	49.06	0.21	0.66	126	66.91
Stover plus Grain + Vetch												
	20000	26.29	0.33	8.66	3.03	0.21	2.52	44.39	0.23	0.86	147	68.75
	26000	25.48	0.30	8.56	3.06	1.17	2.54	42.45	0.22	0.74	170	69.43
	32000	26.94	0.32	8.58	3.01	0.22	2.50	43.90	0.22	0.85	143	68.20
Stover without Grain plus Vetch												
	20000	46.67	0.64	8.54	2.04	0.35	1.69	71.67	0.16	1.32	66	46.22
	26000	47.95	0.66	8.31	1.98	0.36	1.64	71.68	0.13	1.22	65	44.78
	32000	47.02	0.64	7.78	2.02	0.36	1.68	72.21	0.13	1.20	65	45.88
Vetch only (Inside Plot)												
	20000	41.72	1.19	20.35	2.38	0.30	1.98	53.31	0.34	2.55	99	54.07
	26000	43.57	1.29	18.91	2.30	0.33	1.91	52.81	0.31	2.32	97	52.11
	32000	42.61	1.22	19.67	2.35	0.32	1.95	54.21	0.32	2.60	96	53.12
Vetch Only (Outside Plot)												
		42.22	1.04	18.32	2.36	0.26	1.96	25.98	0.28	2.01	101	53.54

***Figure**. Average of feed test results in 2021 and 2022 for various grazing options in a corn-vetch intercrop or corn monocrop system. Acid Detergent Fiber (ADF), Calcium (Ca), Crude Protein (CP), Digestible Energy (DE), Magnesium (Mg), Metabolizable Energy (Met E), Neutral Detergent Fiber (NDF), Phosphorous (Phos), Potassium (Pot), Relative Feed Value (RFV) and Total Digestible Nutrients (TDN) values for each treatment and grazing method are presented.*



< Corn able to get head start while vetch is injured by glyphosate. Photo taken June 28, 2021.

Hairy vetch starts aggressive growth later during post silk stage. Photo taken Aug 11, 2021 >

Harvest began Oct 6, 2021 and some issues with vetch growing upside of corn near the cob which wound around the stalk rollers. Recommend a high cobbing variety if going for grain.

Conclusions

- Hairy vetch may reduce corn biomass but total biomass of either monocrop corn or intercrop is the same however feed quality is improved.
- Reduction in grain yield with use of vetch occurred
- Results suggest an additional 11-21 lbs/ac N in the field economy when vetch is included (biomass N + soil test N). N-fixation began at flower.
- Vetch vines can cause equipment harvest issues for grain and silage equipment, so system is best for grazing
- It would be interesting to compare a wet year

Acknowledgements

Funding for WADO was provided by CAP and ASI**.** Thanks to the WADO crew and summer student Rachelle McCannell who also wrote her U of S thesis on this. Thanks to retired provincial Livestock Specialist Tim Clarke who interpreted the feed tests.