



First year results of 12 annual species polyculture

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Abstract

There has been a generally strong interest in the potential of multi-crop cocktail mixes as a means of improving soil quality, biomass yields and pest control. Therefore, within the long term rotation study located at Swift Current, a 12 species (triticale, barley, oats, corn, sorghum, German millet, hairy vetch, field pea, forage pea, tillage radish, purple top turnip, kale) cocktail mixture was seeded. This poster reports some of the first year findings.

Introduction

Diversity has been suggested as a means for stabilizing yields in times of extreme weather events such as drought. Typically this discussion has centred around perennial species and not annuals. In recent years there has been a great deal of interest in benefits of diverse annual species seeded mixtures. These suggested benefits have included improved soil quality, improved weed control, reduced insect damage and increased yields to name a few. But most of this work has occurred in the more humid regions of North America. This study is an attempt to compare the possible value a twelve species mixture might provide compared to a typical monoculture rotation system. This poster provides the first year's results.

Materials & methods

- The treatment plots were placed within the 65 year old rotation study ongoing at the Semiarid Prairie Agricultural Research Centre located in Swift Current, Saskatchewan
- Plant species were selected from four functional groupings:
 - Cool season grasses (triticale, barley, oats)
 - Warm season grasses (corn, sorghum, German millet)
 - Legumes (hairy vetch, field pea, forage pea)
 - Root crops (tillage radish, purple top turnip, kale)
- All species were seeded together at a seeding ratio of 1:1:1:1:1:1:1:1:1:1:1:1
- Seeding occurred late June, 2012 with no fertilizer applied to this treatment
- The 2011 year was fallow; 2010 the plots were in wheat, and 2009 they were in an alfalfa/grass mix that was terminated in August of 2009
- Plots were cut and baled mid September, 2012
- Turnip and Radish plants were sampled from each plot in September, dried down, ground and sent for analysis to assess micronutrient accumulation
- The same plots will be seeded again in spring 2013

Initial observations

Table 1 Biomass estimations of 12 species mix ; averages from 3 X 1m² clips

Clip Date	Biomass gms/m ²					Total
	Plant Type					
	C3 ¹ Grasses	C4 ² Grasses	Legumes ³	Root Crop ⁴	Weeds	
24-Jul-12	July clips were bulked					195.87
11-Sep-12	308.85	296.59	78.43	3.95	19.45	707.27

1-cool season grasses are triticale, forage oats, feed barley
 2-warm season grasses are sorghum, German millet, corn
 3-legumes are hairy vetch, field pea, forage pea
 4-root crops are forage radish, forage turnip and kale

Table 2 10 m X 45 m plots were cut (Sept. 17), baled (Sept. 20) and bale weights recorded

Average Bale Weight		
kg/m ²	lb/acre	short ton/acre
0.45	4052.74	2.02

Table 3 Turnip and radish sampled in fall , ground and analysed for micronutrient content

Root Crop Micronutrient Analysis		
	Turnip	Radish
Ca HClO ₄ (ppm)	9609.52	9448.94
Cu HClO ₄ (ppb)	3837.12	2449.12
Fe HClO ₄ (ppm)	620.44	161.24
Mg HClO ₄ (ppm)	6632.40	6349.05
S HClO ₄ (ppm)	8584.14	5664.32
Mn HClO ₄ (ppm)	48.90	26.17
ZnHClO ₄ (ppm)	31.39	16.88



Photo on left taken July 11, 2012 and photo on right taken July 18, 2012

Table 4 Bioavailable nitrogen and phosphorous in soil at different times in season

Soil Analysis						
NO ₃ -N in lb/acre						
Sampling Depths						
Rotation	12 Species Mix					
	Sampling Time	0-15cm	15-30cm	30-60cm	60-90cm	90-120cm
S P 1 c 2 i e s	Spring	15.42	27.06	34.89	15.61	7.53
	Harvest	3.11	1.76	5.35	14.32	12.39
	Fall	9.98	2.53	7.20	15.61	12.33
L e n t i l	Spring	15.08	5.20	2.89	6.92	27.85
	Harvest	8.43	2.40	6.25	11.80	19.28
	Fall	11.77	2.38	5.45	11.91	27.29
W h e a t	Spring	6.47	9.13	21.73	10.28	8.77
	Harvest	3.89	1.27	4.79	24.43	29.24
	Fall	5.15	1.49	2.53	6.61	17.51
F a l l o w	Spring	2.72	1.93	6.56	1.11	2.16
	Harvest	since fallow nothing harvested				
	Fall	19.66	7.45	13.41	8.87	8.75
W h e a t	Spring	4.86	35.72	19.64	8.57	6.05
	Harvest	5.45	1.28	2.55	2.76	6.68
	Fall	3.67	0.95	1.64	1.49	2.80

Soil samples were taken prior to seeding, at harvest and in the fall and results compared to other rotations in the study

- Further research is required to make any conclusions
- Weeds were limited within plots despite no herbicide usage
- Flea beetles were minimal compared to surrounding canola fields
- Root crops appear to be concentrating elements possibly to be released for next year's crop
- Yields were respectable despite no additional precipitation following mid-July
- There was no effect on soil phosphorous (results not shown)

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