Adaptation of Oilseed Crops in Saskatchewan William May¹, Yantai Gan², Stew Brandt³, Randy Kutcher⁴ and Guy Lafond¹

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Introduction

anola quality Brassica juncea L. (juncea canola), and hybrid, oilseed sunflowers (*Helianthus annus* L.) have potential for greatly increased production in western Canada.

Juncea canola is a recently developed crop with seed quality similar to cultivars of Brassica napus L. (napus canola) and Brassica rapa L. with canola quality (Woods et al., 1991. and hybrid oilseed sunflowers have largely replaced open-pollinated oilseed sunflowers. (Beckie and Brandt, 1996). The economics of production, which includes the nitrogen (N) response of flax (Linum ustitatissimum L.) and napus canola in western Canada have been relatively well researched (Nuttall and Mahli, 1991; Mahli et al., 2007); However, much less is known about the N response of *juncea* canola and hybrid, oilseed sunflowers. If producers are to grow these two oilseed crops they need information on their adaptation and response to N. Currently there is very limited information comparing the economics of juncea canola, and hybrid oilseed sunflowers to established oilseed crops, canola and flax, in the soilclimatic zones of Saskatchewan using current production practices.

Objectives

To compare the adaptation, N response curves and economic returns juncea canola and hybrid, oilseed sunflowers to flax and napus canola with in various soil-climatic zones of Saskatchewan.



Materials and Methods

Treatments	► Ta
	o 10
► 4 crops	07.
o juncea canola	o 10
o sunflower	o 40
o napus canola	
o Flax	
$\mathbf{O} = \{\mathbf{t}_{1}, \mathbf{t}_{2}, \mathbf{t}_{3}, \mathbf{t}_{$	o jur
8 nitrogen rates (kg ha ⁻¹)	O SU
o 10	o na
o 30	(ny
o 50	o fla
o 70	
090	► Cr
o 110	o ze
o 150	_
o 200	► Fe
	o nit
5 Locations in	o ph
Saskatchewan, Canada	ha
o Indian Head	sug
o Swift Current	o po
o Scott	soi
o Melfort	loca
o Redvers	
	Econo
► Years	
o 2004	► ad
o 2005	= (
o 2006	(ar
—	of
Experimental design	► ca
	an
o three replicates	0.8
o split plot with crop as	
the main effect	Statist
Agronomic Practices	o PF
Agronomic Fractices	
Seeding date	(Lit o A d
o mid-May for both	
canolas and flax with	out
	exc
sunflowers seeded	000
approximately 10 days	o Cr
later	COr
o except Swift Current	o Re
where the first seeding	COr
date was early-May and	
sunflowers were seeded	
10 days later	

- arget Plant Population (plants m⁻² 0 – *juncea* canola sunflower 0 – *napus* canola 00 - flax
- ultivars
- ncea canola Dahinda unflower – 63M02 (hybrid) apus canola – Invigor 5020 x – CDC Bethune
- ropping System
- trogen- determined by treatment hosphorus – a minimum of 20 kg ¹ with more being applied if ggested by soil test tassium and Sulfur – followed I test recommendations for each cation in each year
- mics
- justed gross return
- (Grain yield * grain price) –
- mount of applied N *cost per unit
- Iculated at two grain prices \$200 nd \$400 tonne-1 and four N costs: 85, 1.00, 1.15 and 1.30 \$ kg-1.

tical Analysis

- ROC MIXED procedure of SAS ttell et al., 1996)
- combined analysis was carried t using all locations and years
- cept at Scott due to hail damage
- curring in two years.
- rop, N rate, and location were
- nsidered fixed effects.
- eplicate and year were nsidered random effects

- Crop x N, location x crop, and location x N all affected grain yield. There was a curvilinear increase in grain yield of all four crops as the rate of applied N increased when averaged over locations and years.
- o As the N rate increased from 10 to 90 kg ha⁻¹ grain yield response of *juncea* canola and sunflower was less than that of flax and Napus canola (Figure 1). o The grain yield of *juncea* canola and sunflower increased as N increased to 70 kg ha⁻¹ but did
- not increase at higher N rates.
- o Flax grain yield did not respond to N rates above 90 kg ha⁻¹. o Grain yield of *napus* canola increased as the N rate increased to 200 kg ha⁻¹. A similar
- response was reported by Mahli et al. (2007).
- > Napus canola and flax had similar grain yields at each location and never had a yield lower than sunflower or juncea canola at any location when yield was averaged over N rate and year (Figure 2).
- o The yield of napus canola and flax was greater than sunflower and juncea canola at Indian Head and Melfort when averaged over N rate and year.
- o Napus canola had a higher grain yield than juncea canola at Swift Current. o Flax had a higher grain yield than sunflower at Redvers.



Results and Discussion

- ► The adjusted gross return (gross return minus the cost of applied N) of napus canola and sunflower (Figure 3) and flax and juncea canola (Figure 4) are presented.
- o The adjusted gross return for sunflowers and *juncea canola* was similar from 10 to 70 kg N ha⁻¹ when crop prices are low and N costs high. At N rates greater than 70 kg N ha⁻¹ the adjusted gross return declined.
- The adjusted gross return for sunflower indicated that there was no advantage to increasing N rate as the sunflower price increased and fertilizer cost decreased.
- o A small increase in the adjusted gross return of juncea canola could be captured by increasing the N rate to 90 kg ha⁻¹ as the crop price increased and fertilizer cost decreased.
- o The adjusted gross return of flax did not increase above 50 kg N ha⁻¹ when crop prices are low and N prices high.
- o As the flax price increased, the adjusted gross return for flax was optimized at 90 kg ha⁻



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- Current cultivars of juncea and sunflower are less responsive to applied N than current cultivars of napus canola and flax.
- ✓ Juncea canola did not have an advantage over napus canola under the dry conditions that prevailed at Swift Current.
- The gain yield of sunflower was only similar to napus canola and flax at Swift Current, the driest location with the longest growing season.
- ✓ Shorter season sunflower hybrids are required to improve grain yield in Saskatchewan.
- \checkmark The adjusted gross return indicates that producers using a wide range of N rates may have a similar adjusted gross return.
- A full economic analysis needs to be carried out on this data set.

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