Development and Management of Canola for the Great Plains Region

Supplemental & Alternative Crop Program Project Director Meeting February 22, 2016

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FY15 Project Personnel

Name	Affiliation	Title – Job Description				
Michael Stamm	KSU	PD, Associate Agronomist – Canola Breeder				
Ignacio Ciampitti	KSU**	Asst. Professor, Cropping Systems/Crop Production, Research & Extension				
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Johnathon Holman	KSU**	Assoc. Professor, SWREC Crop Production Research & Extension				
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Jerry J. Johnson	CSU**	Professor, Extension Specialist – Crops Testing Leader				
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Sangu Angadi	NMSU	Assoc. Professor, Dept. of Plant and Envi. Sci., Crop Physiology				
Calvin Trostle	TAMU**	Professor, Extension Agronomist				
**Indicates extension appointment						



Project Goal

- Facilitate the adoption of winter canola as an agronomically and economically viable rotation crop in the southern Great Plains (SGP)
- To stimulate winter canola acreage and production increases in the region, the project will focus on the high priority areas
 - Development and testing of superior cultivars
 - Improved methods of production
 - Transfer of new knowledge to producers
- Metrics of success
 - Increase in planted acres
 - Testing and release of new cultivars with yields above the national average
 - Improve consistency of production using best management practices
 - Attendance, participation, and feedback at extension activities



Objectives

- 1. <u>Develop and evaluate high-yielding and regionally adapted winter canola cultivars.</u> Priority traits include: winter survival, tolerance to sulfonylurea herbicide carryover, tolerance to post-emergence applications of glyphosate herbicide, yield, oil quality and quantity, hybrid parent lines, and blackleg (*Leptosphaeria maculans*) resistance.
- 2. <u>Improve canola cropping systems by addressing agronomic management issues.</u> Management studies include: crop establishment, crop rotation, harvest management, nutrient balance and management, fungicide and growth regulator efficiency, on-farm testing, forage production and quality, and crop modeling in DSSAT.
- 3. Extend cultivar, production, and marketing technologies for canola through appropriate extension and outreach programs. Demonstrate to producers that winter canola is an agronomically and economically viable oilseed and/or grazing crop. The multifaceted extension and outreach program includes participation from faculty, industry personnel, grower organizations, and producers. Methods of delivery may include, but are not limited to, field days, field tours, risk management schools, extension and journal publications, professional society meetings, agronomy updates, radio and television interviews, web-based applications, peer-to-peer interactions, and social media updates via Twitter and Facebook.



Planted Acres in Kansas



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Source: USDA-FSA, *estimated

Planted Acres in CO & TX





Source: USDA-FSA, *estimated

U.S. Canola Yield Trends



Weather Woes

- From last year's presentation
 - "2013/14 was the most challenging season for winter canola production in the last decade"
 - "Lowest yields recorded in the last five"
- 2014/15 was worse yet for the project's trials
 - Extreme decline in temperature in mid-November negatively affected many canola fields – freeze induced desiccation
 - Zero trials harvested in KS, NE, and TX; 1 in NM; 2 in CO
 - Excessive precipitation made harvest conditions difficult
- Where weather didn't affect the crop, yields were excellent



Temperature Contrasts



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December 7, 2015

December 4, 2014



Variety trial locations in Kansas

Location	2010	2011	2012 Yield	2013 (bushels per a	2014	2015	4-yr Avg. (2010-2013)
Andale/Conway Springs	36	12*	26*	58	Poor stand/ Winterkill	Winterkill	33
Belleville			80	59	10	Winterkill	70
Garden City	47	46	46	Hail	22	Winterkill	46
Hutchinson	41	HD**	Drought	42	23	Winterkill	42
Kiowa	HD**	21*	42	Drought	Drought/ Winterkill	Winterkill	32
Manhattan	41	46	44	67	35	Winterkill	50
Marquette	41	42	15*	Freeze		Winterkill	34
Avg. by year	42	34	42	57	23	\bigcirc	
*Drought or severe weathe **Herbicide damage	r negatively af	fected yields					



KSU Early Generation Screening Nursery Enid, OK

Wichita 35% survival 36 bu/acre KS4719 78% survival 56 bu/acre

Trial	Y	<mark>ield (lb/</mark>	a)	Survival (%)				
	Min	Max	Mean	Min	Max	Mean		
EGSN	25.8	58.2	46.4	20.0	77.5	51.2		
GPCVT	35.8	65.7	52.9	23.3	78.3	52.8		

Winter survival scores¹ for select K-State and popular cultivars across Kansas in 2013/14.

Name	Developer	Belleville	Hutchinson	Manhattan	Garden City	Average				
KS4549	K-State	1.5	2.0	2.5	2.8	2.2				
KS4506	K-State	1.7	3.0	3.3	1.3	2.3				
DKW46-15	DeKalb	2.3	2.8	3.8	2.3	2.8				
Riley	K-State	1.8	2.8	3.8	4.0	3.1				
Mercedes	Rubisco	2.7	4.5	4.5	1.0	3.2				
Wichita	K-State	2.5	4.5	4.5	3.8	3.8				
Safran	Rubisco	3.0	4.8	5.0	2.5	3.8				
46W94	Pioneer	4.5	5.0	5.0	4.0	4.6				
Mean ²		3.3	4.2	4.5	2.6					
CV		13.1	13.5	9.2	33.2					
LSD (0.05)		0.7	0.9	0.8	1.4					
¹ Scores based on 1=100-80% survival to 5=20-0% survival										
² Values repres	ent the mean of	all entries at the	e location.							





Blackleg Resistance

Reaction of Canola Entries to Local Races of L. maculens

J. Damicone, C. Diaz, and M. Stamm

				Probable		
E	ntry	Source	Δ <u>ν1,6,7</u>	<u> </u>	Av6,7	Gene
K	S4564	KSU	R/S	R	R/S	Rlm4
К	\$4428	KSU	R/S	R	R/S	Rlm4
V	Vichita	KSU	R/S	S	R/S	?
С	hrome	Momont	R/S	S	R/S	?
D	0KW46-15	DeKalb	R/S	R/S	R/S	?
Н	lyCLASS115W	Croplan	S	S	S	-
S	afran	Rubisco	R	R	R	Rlm7
4	6W94	Pioneer	S	S	S	
V	Vestar (check)		S	S	S	-



New variety releases - 2016

- New Group 2 herbicide carryover tolerant cultivar KSUR1211
- New conventional cultivar with superior winter survival KS4549 or KS4506



Check cultivar – Wichita (red)



K-State Variety Releases

HyCLASS225W (2014)

- Roundup Ready and tolerant to sulfonylurea herbicide soil residual
- Licensed to Croplan by WinField
- HyCLASS220W (2014)
 - Roundup Ready
 - Licensed to Croplan by WinField
- DKW45-25 (2013)
 - Licensed to Monsanto
 - 1st K-State Roundup Ready variety
 - Tolerant to sulfonylurea herbicide soil residual

- KSR07363 (2013)
 - Roundup Ready
 - Licensed to Monsanto
- Griffin (2011)
 - 1st dual-purpose forage and grain variety developed for the Great Plains
- Riley (2010)
 - 1st variety released by K-State possessing 40% oil

National Winter Canola Variety Trials in the Southern Great Plains († Irrigated)										
Location	Chata	:	2015		2014		2013		2012	
Location	State	Mean	Range	Mean	Range	Mean	Range	Mean	Range	
Akron	СО	Wi	interkill	D	rought	Drought		Drought		
Fruita †	СО	1683	602-2997	1705	1060-2323	2213	1427-3005	Herbicide		
Rocky Ford ⁺	СО		N/A	498	107-1052	Wi	nter kill	3007	2113-3832	
Yellow Jacket	СО	3355	2691-3985	W	nterkill	Spri	ng freeze	945	607-1311	
Walsh	СО	Wi	interkill	W	nterkill	Drought,	Spring freeze	Drought		
Andale/Conway Springs	KS	Wi	Winterkill		nterkill	2918	2416-3438	1339	557-2795	
Belleville	KS	Wi	Winterkill		0-1535	2958	2219-3659	3979	3040-4846	
Garden City ⁺	KS	Winterkill		1113	297-1869	Spring freeze/hail		2320	1165-3507	
Hutchinson	KS	Winterkill		402	0-1272	2118	1462-3260	D	rought	
Kiowa	KS	Wi	interkill	Estal	olishment	Drought		2117	1583-2991	
Manhattan	KS	Wi	interkill	W	Winterkill		rusting	2191	1343-3557	
Marquette	KS	Wi	interkill		N/A	Spring freeze		771	345-1629	
Тгоу	KS	Wi	interkill	W	nterkill	Drought		N/A		
Scottsbluff	NE	Wi	interkill	Winterkill		N/A		N/A		
Clovis [†]	NM	3811	2666-4641	1271	807-2061	2707	1680 - 3494	2708	1563-3930	
Chickasha/El Reno/Kingfisher	ОК	1962	1345-3060	Estal	olishment	Tornado		D	rought	
Goodwell *	ОК	Wi	interkill	1755	729-2490	Spri	ng freeze	2113	1474-2656	
College Station	ТХ	1023	408-1593	1173	442-1874		N/A		N/A	
Etter *	тх	Wi	interkill	717	164-1373	Spri	ng freeze	2003	1198-2952	
Lubbock ⁺	ТХ	Wi	interkill	Estal	olishment	N/A	N/A	2368	1292-3346	

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Winter Canola Variety Testing

- K-State coordinates an USDA-NIFA canola research award and the NWCVT.
- The map below identifies participating locations in the 2015/16 season.



★ University research station and USDA-NIFA sub-contractor

NWCVT locations

✓ The NWCVT includes 54 commercial and experimental winter canola varieties from public and private entities.

✓ The NWCVT increases the visibility of winter canola across the USA.

Objectives

2. Improve canola cropping systems by addressing agronomic management issues through scientific research. Management studies include: crop establishment, crop rotation, harvest management, nutrient balance and management, fungicide and growth regulator efficiency, on-farm testing, forage production and quality, and crop modeling in DSSAT.

2015/16 K-State Research Studies

- Seeder (planter, drill) x Population x Variety (OP, hybrid)
 - Garden City
- Tillage (strip till, no till, conventional) x Seeder (planter, drill) x Variety (OP, hybrid)
 - Garden City
- (30-in) Seeding rate (200, 275, 350, 425, 500k) x Variety (Riley, HC115W, Hekip, Mercedes)
 - Manhattan, Hutchinson
- (9-in) Seeding rate (150, 225, 300, 375, 450k) x Variety (Riley, HC115W, Hekip, Mercedes)
 - Manhattan, Hutchinson
- Harvest Management (Swath, desiccate, direct, pod seal) x Variety (Riley, Mercedes, HC115W)
 - Hutchinson
- Canola/wheat rotation frequency
 - Hutchinson

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- W/W, C/W, C/W/W, C/W/W, C/C/W
- Nutrient balance and management
 - Cultivar (OP & Hybrid) x Plant density (low, medium, high)
 - Biomass, N, P, K, S, B, and Zn measured

Canola Biomass and Nutrients



How Much N, P, K, and S Does Canola Take Up?



- Final grain yield was 37 bu/a and biomass was 4,500 lb/a with harvest index of 0.59.
- Close to 50% of total biomass reached by flowering.





Canopy Temperature Map



25.0 31.5 38.0 44.5 51.0 (°C) Colorized temperature map over canola field, depicting differences in canopy temperature among replications measured with the sUAS (04/25/2014).



Canola Biomass, BNDVI & Canopy Temperature



- Canola biomass at flowering stage was highly and positively correlated with the BNDVI.
- Canola biomass at flowering was negatively associated and presented a non-lineal relationship with canopy temperature.



October 12, 2015

Mercedes 375,000 seeds/acre

Mercedes 150,000 seeds/acre

Survival x Seeding Rate

Manhattan, KS - 2014



**Hybrid varieties 46W94 and 46W99 did not survive the winter.





NWCVT Summary for Clovis, NM

Growing	Entry#	Seeding	Fall stand /	Irrigation	Precipit	Total (Irrig	lb seed	Seed Yield	Average
Season		date	Winter	(in)	ation	+ Precip,	per in	range (lb/a)	Seed Yield
			survival [†]		(in)	in)	water		(lh/a)
2		Late Sprin	g Freeze Dama	ge and Recov	ery by Win	ter Canola at C	lovis, NM	in 2009	
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Late Spring Frost (Mar 28, 2009)

Damaged Canola (April 17, 2009)

Recovered Canola (April 30, 2009)

2012-15 Saw repeated spring neezes but recovery was

excellent

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Control 12-3-13 2-13-14 3-28-14 Control 12-3-13 2-13-14 3-28-14



Safran



TAM 111



NMSU Forage Quality Study

	Dry	Crude					
Crop/Cultivars	matter	Protein	ADF	NDF	RFV	RFQ	Nitrate
Fall harvest (12/03/2013)	(lb/a)	(%)	(%)	(%)			(ppm)
Canola	4981	24.5	17.3	17.9	408	474	2722
Wheat	4325	23.4	17.8	34.2	204	202	307
Spring harvest (02/13/2014)							
Canola	4299	20.3	21.8	22.1	326	368	1772
Wheat	4080	21.9	19.8	37.8	181	197	113
Spring harvest (03/28/2014)							
Canola	6750	22.2	21.7	22.6	304	323	1416
Wheat	6210	19.1	25.0	44.0	147	174	121
Spring harvest (04/29/2014)							
Canola	9805	20.7	30.5	32.4	188	216	2309
Wheat	9895	15.4	28.3	48.8	128	156	127
Fall harvest (11/24/2014)							
Canola	2895	28.9	16.5	17.2	425	416	5712
Wheat	2428	27.6	16.5	38.2	186	119	931
Spring harvest (03/16/2015)							
Canola	3341	23.0	20.0	20.8	354	375	1141
Wheat	4837	21.2	21.0	43.7	155	172	74
Spring harvest (04/20/2015)							
Canola	8755	21.6	28.7	31.8	201	232	2429
Wheat	10557	14.3	26.8	50.1	127	173	80

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Oil and Seed Yield Effects

- Canola can be used as a dual-purpose crop with limited irrigation water
- Oil content was not affected by fall or early spring grazing (38%) compared to the control (39%), but midto late-April grazing was slightly lower (36%)
- Canola yield was reduced 27-43% with fall or early spring grazing and 68-87% with mid-April grazing
- Winter wheat yield was increased 27-55% with fall or early spring grazing while mid- to late-April grazing resulted in 14-89% reduction in seed yield



3. Extend cultivar, production, and marketing technologies for canola through appropriate extension and outreach programs. Demonstrate to producers that winter canola is an agronomically and economically viable oilseed and/or grazing crop. The multifaceted extension and outreach program includes participation from faculty, industry personnel, grower organizations, and producers. Methods of delivery may include, but are not limited to, field days, field tours, risk management schools, extension and journal publications, professional society meetings, agronomy updates, radio and television interviews, web-based applications, peer-to-peer interactions, and social media updates via Twitter and Facebook.





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Producer Surveys

- These surveys measure effectiveness and provide stakeholder input on developing grant proposals
- At 07-Aug-14 risk management school, 82% of participants indicated their "ability to manage risks improved after the presentations"
- At schools on 5-Mar-15 and 10-Mar-15, 90% and 97% of participants, respectively, indicated the information presented was either "valuable" or "very valuable"
- 57% of participants on 10-Mar-15 said "they would take action or change production practices" because of the information presented
- On 07-Aug-14, 27% of respondents said "intensive management" was the greatest economic risk, and 33% stated "winter survival" was the greatest production risk



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