

**Canola Symposium
Roseau City Center**

**December 7, 2021
Roseau, MN**



UNIVERSITY OF MINNESOTA

MN Canola Research - 2021

- **U of MN - Magnusson Research Farm**
 - 40 acre site located 6 miles NW of Roseau
- **Northern Resources Cooperative**
 - 14 acre site located 1 mile west of Roseau on Hwy 11
- **Research Team:**
 - Dr. Nancy Ehlke: PI, U of MN, St. Paul
 - Donn Vellekson: Project Manager, U of MN, St. Paul
 - Dave Grafstrom: Research Agronomist, Roseau, MN
 - Val Laidley: Summer Intern

Canola Research Projects - 2021

- **Variety Trial, 21 entries: 12 LL & 9 RR**
- **Shatter Trial, 13 entries: 9 LL & 4 RR**
- **Canola Seed Treatment Trial**
- **Nitrogen Use Efficiency**
- **Micronutrients**
- **Banding of Nitrogen - Wide Row Canola**
- **Soil Applied Herbicides**
- **Winter Canola**

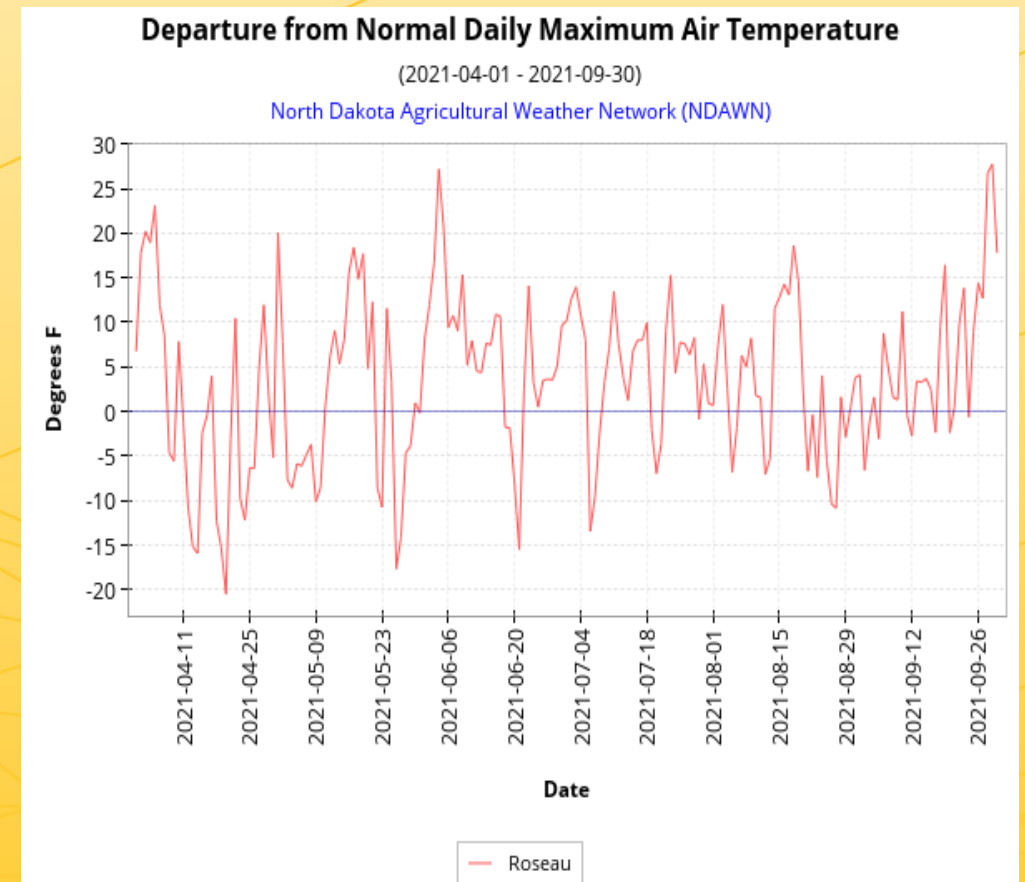


Presentation Today

- **Variety Trial**
 - **Shatter Trial**
 - **Canola Seed Treatment Trial**
 - **Nitrogen Use Efficiency (NUE)**
 - **Winter Canola**
-
- **Annual Report posted on web: www.mncanola.org**



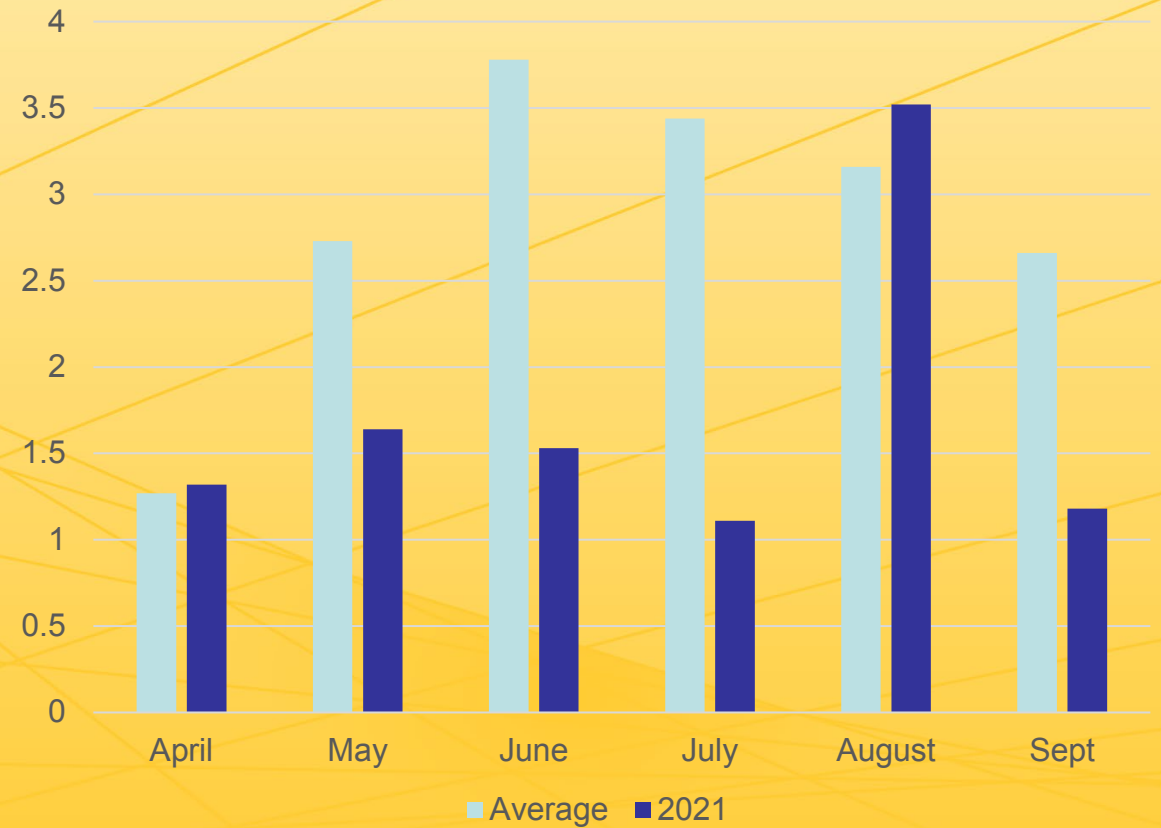
2021 Growing Season Was Hot



2021 Growing Season Was Dry



Monthly Rainfall



Canola Variety Trial - Methods

- **Fertilizer applied PPI: 140-30-30-20s**
- **Seeding rate: 12 PLS/ft² (PLS from seed companies)**
- **Seeding date: 5/12/21**
- **Grizzly Too: 1.5 oz/ac applied on 5/28/21**
- **Proline: 5.7 oz/ac applied at first petal drop**
- **Swathing date: 8/4/21**
- **Harvest date: 8/25/21**

Canola VT - CPC July 31

RR - Heavier Soil



LL - Lighter Soil



Canola Variety Trial - 2021

	Company	Entry	Herbicide Tolerance*	Maturity	#/acre	Protein	Oil	Test wt./bu.	% Ground Cover-21DAP	ESV-21DAP	Begin Bloom Date	End Bloom Date	Days of bloom	Harvest Height (in)
1	Winfield United	CP9978TF	TF	L	2329	22.3	44.6	52.6	63	6.0	23-Jun	11-Jul	18	49
2	Star Specialty Seed	StarFlex	RR	M	1978	22.1	45.5	52.6	60	5.5	23-Jun	12-Jul	19	48
3	Pioneer	45CM39	RR	M/L	1667	21.8	46.1	51.3	48	4.5	23-Jun	12-Jul	19	48
4	Nuseed	NC155 TF	TF	E	2139	22.8	43.5	53.0	78	7.5	21-Jun	11-Jul	20	48
5	Nuseed	NC471 TF	TF	L	1806	22.2	44.7	52.9	70	7.0	23-Jun	10-Jul	17	52
6	Nuseed	NC527CR	TF	L	1911	22.2	44.0	51.3	55	5.5	24-Jun	12-Jul	18	48
7	BrettYoung	BY 6211TF	TF	M	2137	22.6	44.5	52.7	63	5.5	23-Jun	11-Jul	18	50
8	Meridian Seeds	CS3000 TF	TF	M	1909	21.4	45.8	52.7	50	5.5	21-Jun	9-Jul	18	45
9	Wilbur Ellis	Integra 7361RC	RR	M	2115	22.4	44.5	52.2	45	4.5	24-Jun	11-Jul	17	45
10	Meridian Seeds	CS4000 LL	LL	M	1518	22.4	43.5	53.1	61	6.0	24-Jun	12-Jul	18	48
11	BASF	InVigor L233P	LL	E	1819	21.7	42.9	52.7	73	6.5	26-Jun	11-Jul	15	47
12	BASF	InVigor L255PC	LL	L	1619	20.7	45.6	52.8	63	6.0	26-Jun	13-Jul	17	52
13	BASF	InVigor L345PC	LL	L	1947	20.8	43.3	52.9	73	7.0	26-Jun	13-Jul	17	55
14	BASF	InVigor L340PC	LL	E	1613	21.8	42.6	52.2	70	7.0	25-Jun	11-Jul	16	49
15	Winfield United	CP7130LL	LL	L	1781	21.5	43.6	52.0	78	7.5	24-Jun	10-Jul	16	52
16	Winfield United	CP7144LL	LL	L	1783	23.3	44.4	52.0	60	6.0	24-Jun	10-Jul	16	49
17	Dekalb	DKTFLL21SC	LL/TF	M	1866	21.4	46.6	52.3	65	6.0	22-Jun	8-Jul	16	44
18	Dekalb	H19W94354	LL	M	1576	21.8	45.6	52.1	50	5.5	23-Jun	9-Jul	16	42
19	Dekalb	DKLL82SC	LL	E/M	1640	22.4	45.4	52.5	55	6.0	24-Jun	11-Jul	17	44
20	Pioneer	P506ML	LL	M/L	1446	21.9	43.9	51.7	53	5.0	24-Jun	12-Jul	18	53
21	Pioneer	P505MSL	LL	M/L	1735	21.8	42.9	51.7	58	6.5	24-Jun	11-Jul	17	55
			LSD @ 5% level		251	0.7	0.7	0.3	20	2.0	1	1	2	4
			LSD @ 10% level		209	0.6	0.6	0.2	16	1.7	1	1	2	3
			CV(%)		9.7	2	1	0.3	23	23	3	9	4	6



Canola Yield Components and Drought

Components of Yield

- Plant density
- Branches/plant
- Pods/plant
- Seeds/pod
- Seed weight

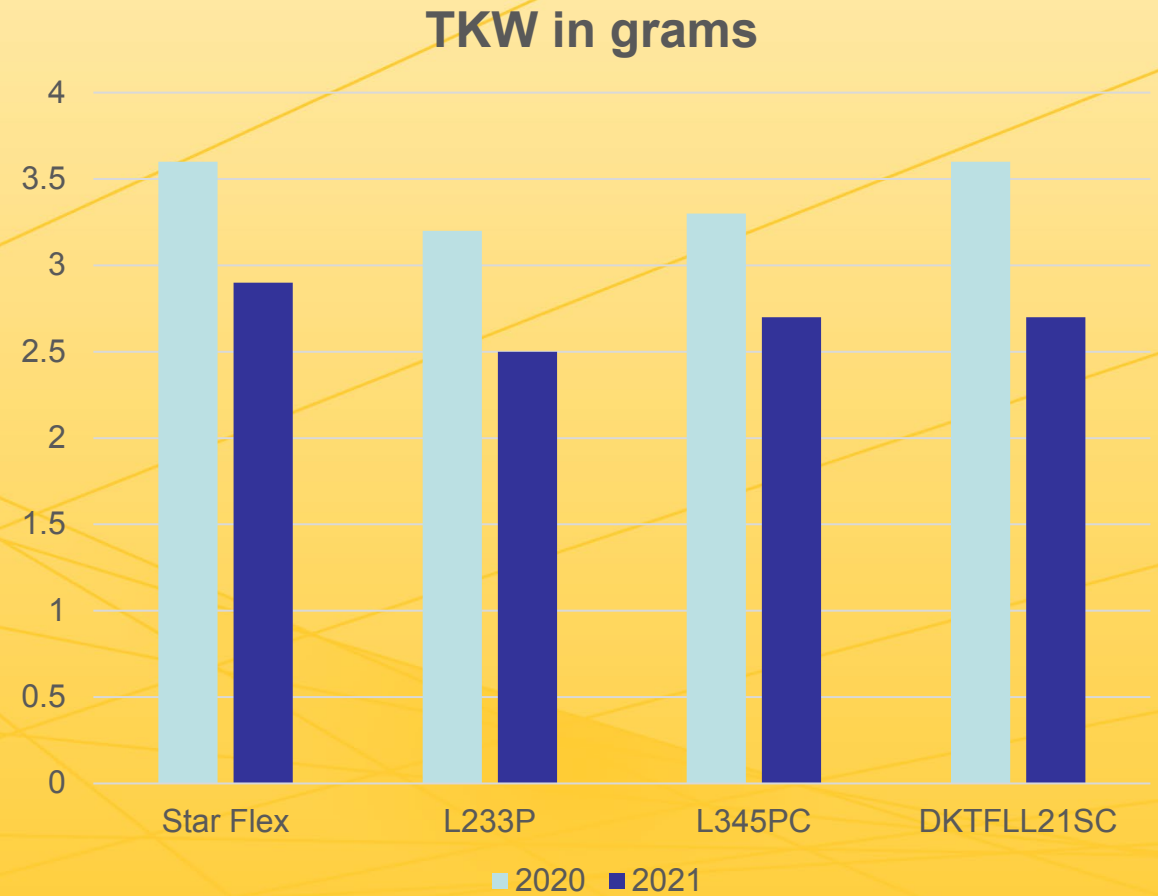
Drought Impacts on Yield Components



Drought Conditions in 2021



Thousand Kernel Weights (TKW) in 2020 and 2021



Canola Variety Trial - Results

- **Average Yield = 1,825 #/ac; RR = 1,999 #/ac; LL = 1,695 #/ac**
- **Yields ranged from 1,446 - 2,329 #/ac**
- **CV for yield 9.7%**
- **RR and LL comparisons confounded due to soil moisture differences**
- **Average days of bloom for RR varieties = 18.2; LL = 16.5**
- **Canola thousand kernel weight (TKW) on selected varieties averaged 21% less in 2021 vs 2020**
- **Mean canola yields reduced by 400#/ac due to lower TKW**

Canola Shatter Trial - Methods

- **Canola varieties submitted by seed companies**
- **Canola seeded in 12 inch rows @ 9PLS/ft² on 5/12/21**
- **Two collection pans, (7"x13") put out at swathing 8/4/21**
- **If swathed, canola harvest date would have been 8/25/21**
- **Seed collection dates:**
 - **8-12 (8 days in field)**
 - **8-18 (14 days in field)**
 - **8-23 (19 days in field)**
 - **8-30 (26 days in field)**

Collection Pans Placed Between 12 Inch Canola Rows



Canola Collection Pans

Seeds



Seeds, Pods & Branches



Canola Shatter Trial - 2021

Variety	Company	Herbicide tolerance	Yield lb/acre	% Seed Lost	All Source Seed Loss			Total seed lost by date(#/acre)				Source of seed loss by date(#/acre)							
												Total	seed	pod	8/12	8/18	8/23	8/30	8/12 seed
					8/12	8/18	8/23	8/30	8/12	8/18	8/23	8/30	8/12	8/18	8/23	8/30	8/12	8/18	8/23
InVigor L233P	BASF	LL	1819	13.7	249	70	179	99	84	61	6	21	78	23	61	22	39	4	2
InVigor L255PC	BASF	LL	1619	23.7	383	175	208	137	99	130	17	59	78	35	64	69	62	12	4
InVigor L345PC	BASF	LL	1947	12.3	240	125	114	96	55	81	8	33	64	34	21	53	28	6	2
InVigor L340PC	BASF	LL	1613	8.2	133	89	44	50	39	33	12	34	15	24	14	19	14	12	0
CP7130LL	Winfield United	LL	1781	60.4	1076	700	376	421	230	387	39	245	175	133	97	289	98	33	6
CP7144LL	Winfield United	LL	1783	29.5	526	284	241	257	102	144	21	123	134	57	45	93	51	11	10
H19W94354	Dekalb	LL	1576	17.9	282	103	179	118	96	62	6	46	71	19	77	33	29	4	2
DKLL82SC	Dekalb	LL	1640	18.8	309	92	217	154	59	83	14	39	114	17	42	31	51	4	9
DKTFLL21SC	Dekalb	LL/TF	1866	18.1	338	109	229	157	75	97	8	43	114	22	53	40	58	4	4
Integra 7361RC	Wilbur Ellis	RR	2115	21.5	455	266	190	166	85	180	25	83	83	38	47	133	47	13	12
StarFlex	Star Specialty Seed	RR	1978	17.2	340	141	199	155	73	103	9	48	107	20	54	66	37	7	2
CP9978TF	Winfield United	TF	2329	10.2	238	50	188	96	68	68	5	13	83	9	59	25	43	3	2
BY 6211TF	BrettYoung	TF	2137	14.6	313	53	260	162	51	93	7	17	145	7	43	26	68	3	4
	LSD @ 5% level		251		161	70	119	97	47	67	15	40	71	19	49	36	41	11	9
	LSD @10% level		209		133	58	99	80	39	56	12	33	59	16	41	30	35	9	7
	CV(%)		10		30	28	41	42	38	40	77	45	51	40	66	36	60	87	131



Shatter Trial Summary

- **Significant seed and pod shatter from all varieties at first collection date on 8/12/21 (8 days after swathing)**
- **In past years, seed and pod drop delayed a couple weeks after pans placed between rows**
- **Total canola seed loss ranged from 133 to 1,076 #/ac**
- **Percent canola seed lost ranged from 8.2 to 60.4%**
- **In dry years, timely harvest is critical to reduce seed loss**
- **If direct harvest is a consideration choose a variety that has good seed and pod shatter tolerance**



Flea Beetles in NW MN

In Past Years - One Species



Today - a Mixture of Two Species



Flea Beetle Damage – Canola Council Canada

Flea Beetle Damage on Canola

Scout for flea beetle damage in several places throughout the field, including field edges, hedgerows, and bluffs, ideally at five points, in a "W" pattern, checking 10 plants at each point (to get a representative sample).

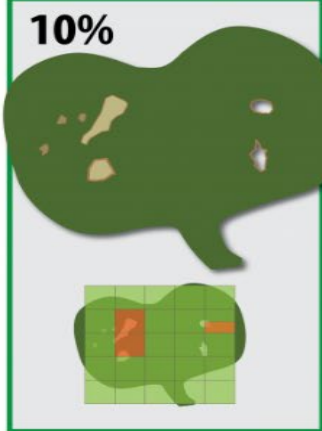


Crucifer
Flea Beetle

2.5 mm
0.1"



Striped
Flea Beetle



Feeding damage is less of a concern with moderate temperatures, good soil moisture and an adequate plant stand, but it becomes a greater concern with lower plant stands, lower moisture and higher temperatures.



25% is the action threshold and 50% is the economic threshold

Once the action threshold is reached, consider applying foliar insecticide if prior to the four-leaf stage and if flea beetles are still present and actively feeding (by checking for evidence of fresh feeding wounds and/or damage to newly-emerged leaves) to prevent reaching economic injury levels.

Stem Feeding

Include the inspection of cotyledon stems when flea beetle scouting. No specific threshold exists to evaluate the impact of stem feeding, but due to the function of the stem (supplying water to the leaves) and its fragility when young, stem feeding can be more damaging than leaf defoliation and even cause plant fatality (especially under hot and dry conditions).

Second Generation Flea Beetle Damage Yield Consequences??

Leaf feeding



Pod Feeding

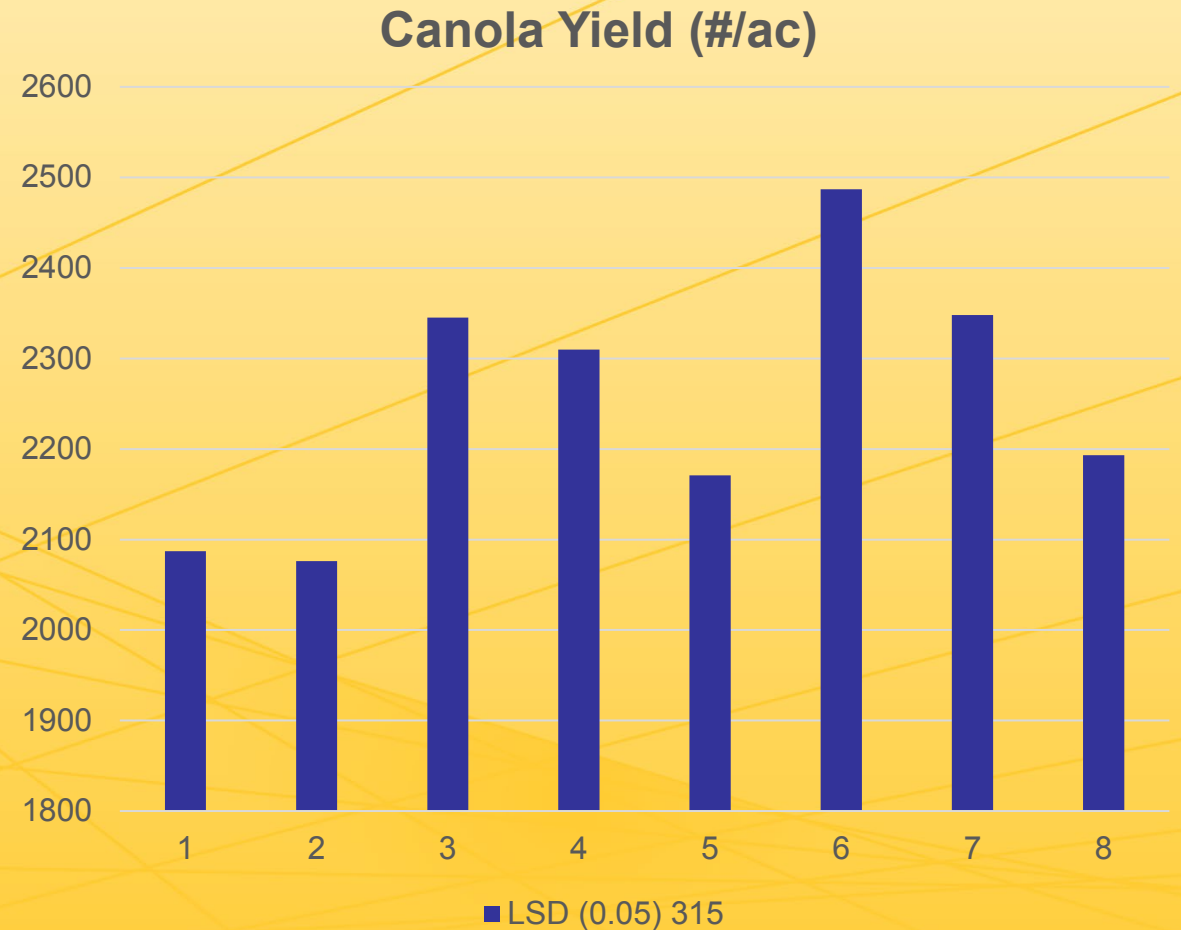


Canola Seed Treatment Trial - 2021

Seed Treatment	Yield(#/acre)		10% bloom		End bloom		Visual Plant Vigor Rating					Ht.(in.)		% stand		Protein		Oil		
	Mag	NR	Mag	NR	Mag	NR	8-Jun		10-Jun	16-Jun		at Harvest		28-May		at Harvest		at Harvest		
							Mag	NR	NR	Mag	NR	Mag	NR	Mag	NR	Mag	NR	Mag	NR	Mag
1 DTKFLL21SC - Untreated	2087	1118	21-Jun	24-Jun	13-Jul	12-Jul	4	4	5	5	5	44	40	68	75	23	24	43	45	
2 EverGol Prime	2076	1256	21-Jun	24-Jun	13-Jul	12-Jul	4	5	5	5	6	44	41	58	83	24	24	43	45	
3 Prosper EverGol	2345	951	21-Jun	24-Jun	12-Jul	12-Jul	4	3	4	7	5	43	42	70	70	23	24	44	45	
4 Prosper EverGol+Buteo Start	2310	1314	21-Jun	23-Jun	11-Jul	10-Jul	7	6	6	9	8	45	41	75	78	23	24	43	45	
5 Prosper EverGol+Fortenza	2171	1142	21-Jun	24-Jun	13-Jul	11-Jul	5	5	5	7	7	42	42	68	80	23	23	44	45	
6 Prosper EverGol+Fortenza+Buteo Start	2487	1322	20-Jun	23-Jun	13-Jul	10-Jul	6	7	7	8	8	46	39	65	83	23	23	43	45	
7 Helix Vibrance	2348	1129	20-Jun	24-Jun	12-Jul	12-Jul	6	4	5	8	6	45	43	73	70	23	23	44	46	
8 Helix Vibrance+Fortenza	2193	1156	20-Jun	24-Jun	13-Jul	10-Jul	5	6	6	7	7	44	42	68	75	23	22	43	47	
9 Star 402 RR - Untreated	1930	NH	22-Jun	24-Jun	13-Jul	11-Jul	4	5	4	5	6	42	41	55	75	21	20	46	48	
10 Helix Vibrance	2156	NH	23-Jun	24-Jun	14-Jul	10-Jul	3	5	5	5	6	45	39	55	73	21	22	46	47	
11 Helix Vibrance+BioForage	1996	NH	22-Jun	24-Jun	12-Jul	11-Jul	4	5	4	5	6	43	40	60	75	21	23	46	46	
	LSD @ 5% level	315	282	1	1	1	1	2	2	1	2	2	3	3	12	NS	1	1	1	2
	CV(%)	10	14	4	2	6	8	32	24	19	20	19	5	5	13	12	3	4	2	2

Canola Seed Treatment Trial - U of MN Mag Farm

- **Variety: DTKFLL21SC**
- **1 = Untreated**
- **2 = EverGol (EG) Prime**
- **3 = Prosper (P) + EG**
- **4 = P+EG+Buteo Start (B)**
- **5 = P+EG+Fortenza (F)**
- **6 = P+EG+F+B**
- **7 = Helix Vibrance (H)**
- **8 = H+F**



Canola Seed Treatment Trial - Results

- **Two varieties: DTKFLL21SC provided by Bayer and Star 402 provided by Jim Johnson**
- **An untreated (bare seed) was included for both varieties**
- **Two locations: U of MN - Magnusson Research Farm (MF) and Northern Resources (NR)**
- **At MF, Prosper Evergol+Fortenza+Buteo Start: 400# more canola yield than untreated; LSD (0.05) = 315**
- **Planting date: MF; 5/7 and NR; 5/12**
- **NR site, bird predation & drought (data not reliable)**

Canola Flea Beetle Damage - 2021

Leaf Feeding



Leaf and Stem Feeding



Canola Seed Treatment Trial - 2021

Untreated – 38 Dap



Prosper EverGol+Fortenza+Buteo



Nitrogen Use Efficiency (NUE) in Canola

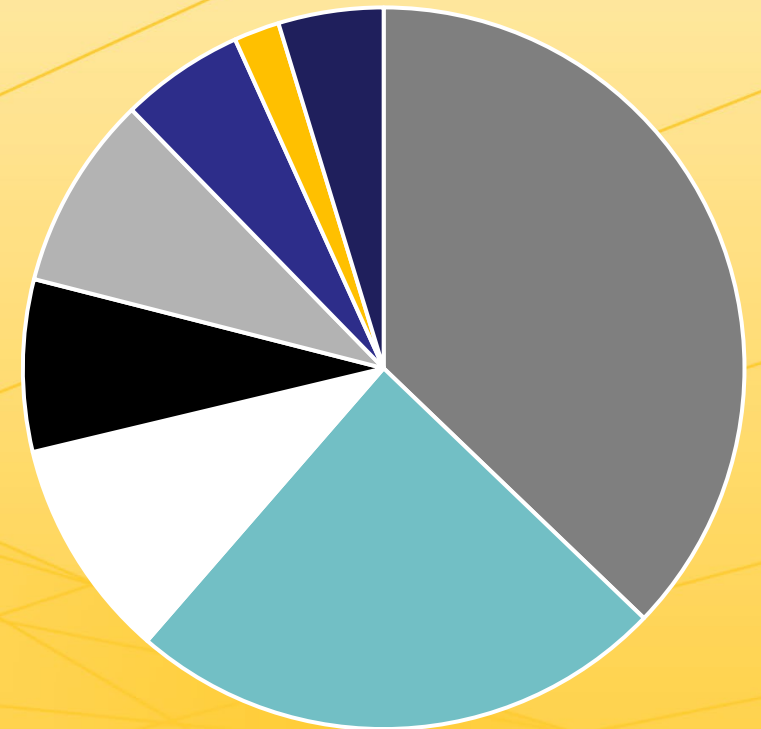
- **Trial objective is to evaluate nitrogen formulations, rates and timings to improve nitrogen use efficiency in canola**
- **The average NUE in United States was 41% according to data published in 2019**
- **What can be done to improve NUE in canola? Nitrogen formulations, rates, timings?**
- **Nitrogen is most expensive input for canola growers (NDSU Crop Budgets)**

Canola Direct Costs 2021 = \$234.99

Source: NDSU Crop Budgets for NE ND

- Fertilizer = \$86.8 (37%)
- Seed = \$56.5 (24%)
- Herbicides = \$23.10 (9.8%)
- Repairs = \$19.82 (8.4%)
- Fungicide = \$18.00 (7.7%)
- Fuel & Lube = \$12.94 (5.5%)
- Crop Insurance = \$11 (4.7%)
- Op Interest = \$4.77 (2%)

Canola Direct Costs

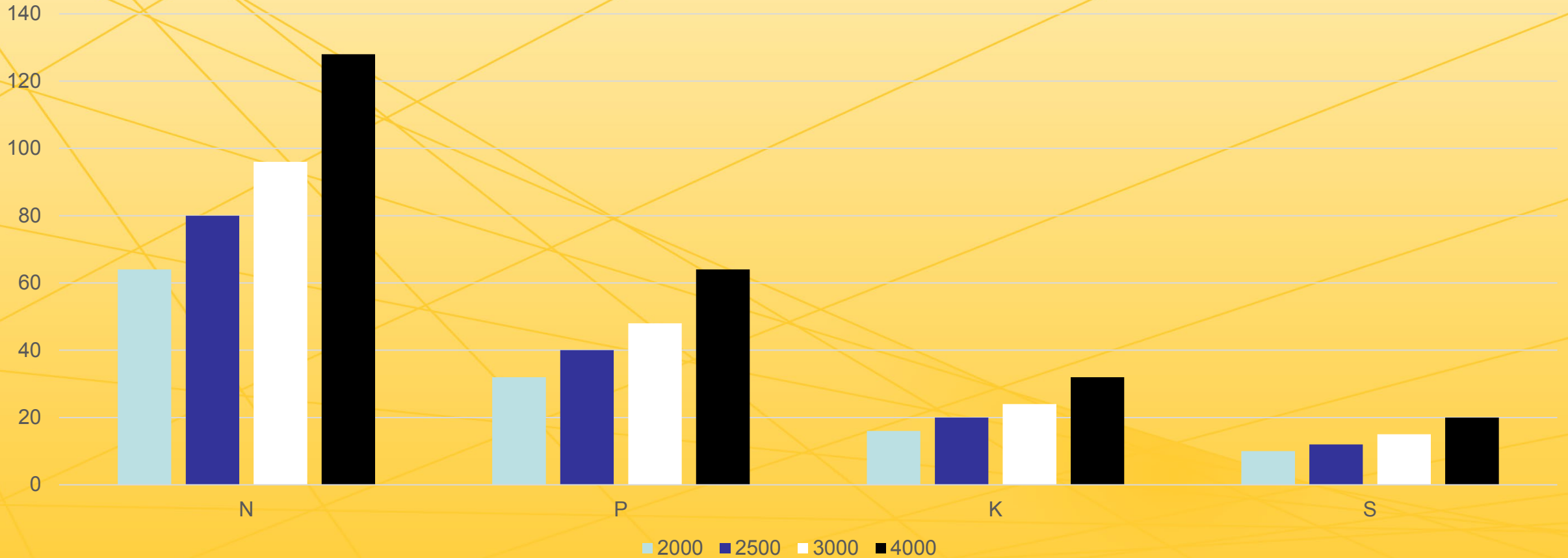


■ Fertilizer ■ Seed ■ Herbicides ■ Fungicides
■ Repairs ■ Fuel&lube ■ Interest ■ Crop Ins

Canola Nutrient Uptake by Yield Goal

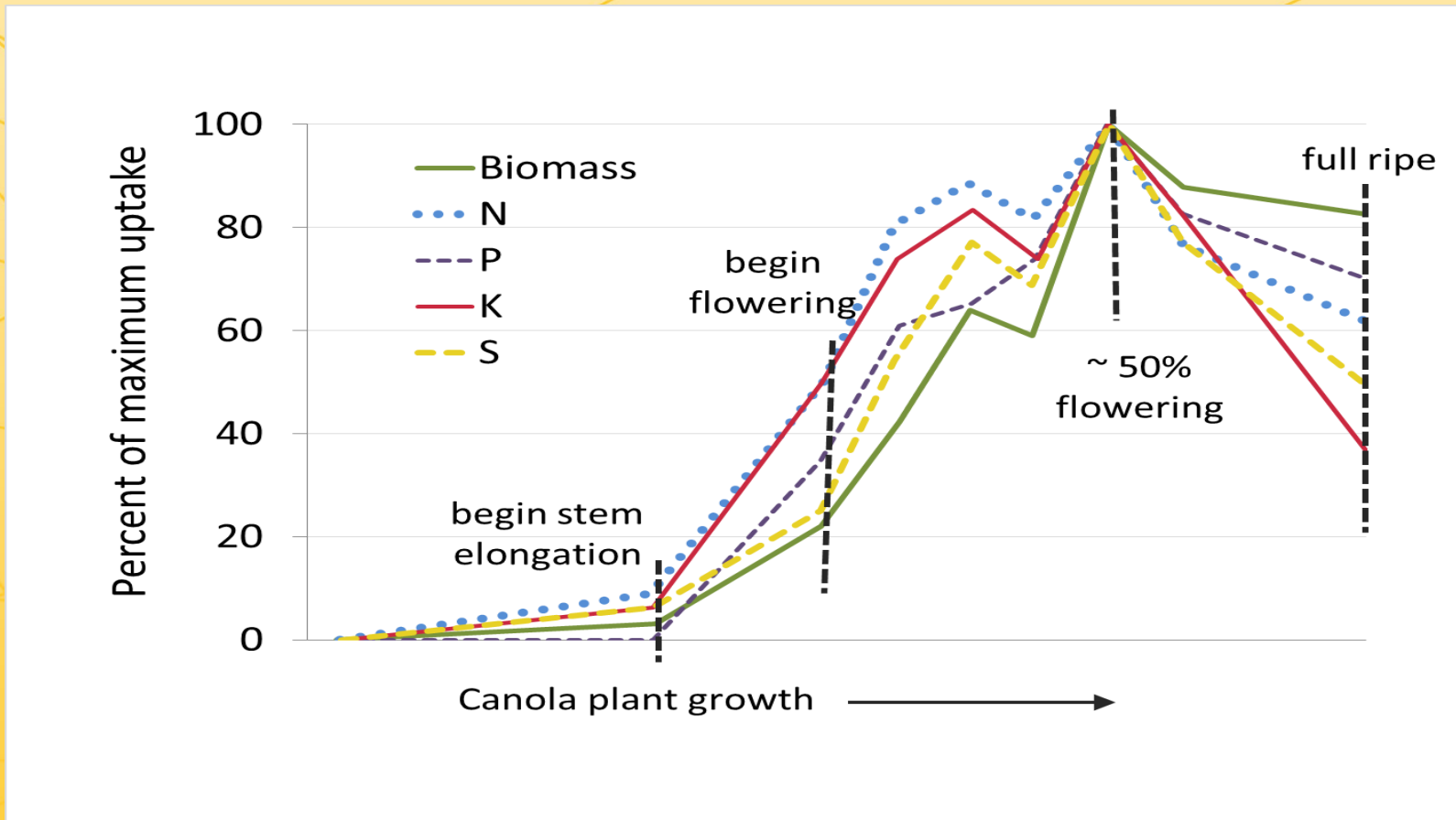
Source: IPNI

Nutrient Uptake (#/ac)



Canola Nutrient Uptake Over Time

Source: Canola Council of Canada



World Record Canola Yield and Production Practices to Attain Top-End Yields

World Record Canola Yield

- Richard Budd, UK
- Winter canola
- 6,420 #/ac; 3.21 tons/ac!

- Highest small plot canola yields at CPC; 4,000 #/ac

Production Practices - High Yields

- Attention to details - timing is critical in planting, CPP, harvest
- Variety selection
- Planting speed, depth, uniformity
- Previous crop
- Starter fertilizer
- Two to four applications of N
- Micros at stem extension
- Two to three fungicides

Canola NUE Trial - Methods

- Fertilizer applied PPI: 40-40-40-20s
- L234PC seeded @ 12 PLS/ft² on 5/12/21
- Dry N fertilizer amounts applied by hand, PPI on 5/11 and early post (3-5 leaf) 6/10/21. Liquids applied 6/10/21
- Grizzly Too at 1.5 oz/ac applied for flea beetle on 5/27/21
- Proline 5.7 oz/ac applied at first petal drop
- Direct harvest date - 8/26/21



Nitrogen Use Efficiency Trial - 2021

	Total Nitrogen added	PPI-urea	PPI-ESN	# N Post emerge	#/acre	Protein	Oil	Palmitic acid Dry basis	Stearic acid Dry basis	Oleic acid Dry basis	Linoleic acid Dry basis	Linolenic acid Dry basis	Erucic acid Dry basis	Test wt./bu.	% Ground Cover-21DAP	ESV-21DAP	Begin Bloom Date	End Bloom Date	Harvest Height (in)
1	0				861	20.9	44.6	4.34	2.07	70	17.5	7.2	1.9	51.6	70	7.0	23-Jun	7-Jul	43
2	60	60	0		1052	22.6	43.2	4.38	2.10	68	17.4	6.9	2.0	51.9	75	7.0	24-Jun	8-Jul	49
3	90	90	0		1079	23.1	42.8	4.43	2.07	68	17.5	6.7	2.0	51.7	78	7.5	23-Jun	7-Jul	47
4	120	120	0		1109	23.0	42.8	4.45	2.06	68	17.7	6.8	1.9	51.8	68	7.0	24-Jun	8-Jul	48
5	160	160	0		1136	22.8	43.1	4.40	2.08	68	17.5	6.9	1.9	51.7	75	7.5	23-Jun	8-Jul	47
6	60	30	30		1102	22.9	42.9	4.41	2.04	69	17.6	6.8	2.0	51.7	75	7.5	23-Jun	8-Jul	45
7	90	45	45		1028	22.6	43.1	4.43	2.06	67	17.7	7.0	2.0	51.7	73	6.5	24-Jun	8-Jul	45
8	120	60	60		1012	23.2	42.6	4.42	2.03	66	18.0	6.7	1.9	51.9	73	6.5	23-Jun	8-Jul	44
9	160	80	80		1039	23.1	42.8	4.38	2.00	65	17.9	6.9	2.0	51.7	70	7.0	23-Jun	9-Jul	46
10	90	40	0	50#N+Agrotain Ultra	1064	23.0	42.8	4.39	2.03	67	18.0	6.8	1.9	51.9	78	7.0	23-Jun	8-Jul	45
11	120	40	0	80#N+Agrotain Ultra	1103	23.0	42.9	4.42	2.07	67	17.8	7.0	2.0	52.2	63	6.0	23-Jun	8-Jul	46
12	90	40	0	50#N- 28% UAN	1026	22.6	42.9	4.43	2.08	68	17.7	7.0	1.9	52.1	55	5.5	24-Jun	9-Jul	46
13	120	40	0	80#N- 28% UAN	1060	23.4	42.4	4.44	2.10	67	17.8	7.2	1.9	52.1	70	7.0	23-Jun	8-Jul	47
Experimental Design: RCB with 4 reps				LSD a@5% level	169	0.7	0.7	0.06	0.07	2	0.5	0.3	NS	0.3	20	1.7	NS	1	3
				CV(%)	11	2	1	1	2	2	2	3	8	1	20	18	3	11	5



Nitrogen Use Efficiency 2021 - Results

- **Canola yields ranged from 861 to 1,136 #/ac**
- **LSD (0.05) for yield 169 with a CV of 11%**
- **All fertilizer treatments gave higher canola yield than the untreated, but no differences between treatments**
- **Drought conditions in 2021 impacted canola yields (trial average yield 1,052 #/ac)**
- **The low average yield masked any treatment effects and conclusions are overshadowed by drought conditions in 2021**

Winter Canola in NW MN

Why the Interest in Winter Canola?

- Improved genetics
- Favorable price
- Improved yield potential - 1.3 to 1.5 times vs spring canola
- Soil conservation - plants growing in fall and early spring
- Less spring field work
- Warmer temps and delayed killing frost in the fall?

Small Plot Trial Seeded - 2021

- Three canola varieties seeded with good winter hardiness score
- Mercedes
- Surefire
- KS4719
- Two seeding dates: 8/11 & 9/1
- Contacts: Mike Stamm KS, Jim Davis ID, Perry Miller MT, Brian Caldbeck KY



Winter Canola Crown Set - 10/20/21

Canola Crown at Soil Surface



Elevated Hypocotyl



Winter Canola Height - 10/20/21

Early Seeding



Late Seeding



Winter Canola Rooting - 10/20/21

Early Seeding



Late Seeding



Winter Canola in NW Minnesota

What's the Future of Winter Canola



Trial Overview - Oct 2021



Questions



Contact Information

- **Dave Grafstrom**
- **Email - Grafts010@umn.edu**
- **Cell: 320-293-8722**

- **Complete canola research reports from 2021 and previous years are posted on the MN Canola web site: mncanola.org**