Minnesota Canola Symposium
CPC Project Summary

November 30, 2023

Roseau, MN

UNIVERSITY OF MINNESOTA

MN Canola Research Overview - 2023

- CPC Site - Northern Resources 1 mile west of Roseau
- Marble sized hail - July 13
- CPC Field Day - July 19
- Four canola fields sampled for clubroot and sent to Venkat Chapara's lab in Langdon, ND
- Bertha armyworm and Diamondback moth pheromone trapping project in cooperation with Knodel at NDSU

Canola Research Projects - 2023

- Variety trial 20 entries: 10 LL & 10 RR
- Shatter trial 14 entries: 7 LL & 7 RR
- Flea beetle trials (1-seed treatment and 1-foliar only)
- Micronutrients
- Stoller Plant Power
- Soil applied herbicides
- Winter canola (St. Paul and Roseau)
- Insect monitoring, clubroot survey

Presentation Today

- Variety trial
- Shatter trial
- Flea beetle trials (brief summary as Knodel's presentation will go into greater detail)
- Soil applied herbicides
- Winter canola
- Insect survey
- Annual Report posted on web: www.mncanola.org

2023 Growing Season - Recap

- Dry spring with below normal rainfall
- Above average temps in May and June
- Marble sized hail and wind gusts up to 50 mph - July 13
- Moderate to heavy flea beetle pressure
- Warm and dry summer
- Limited white mold pressure
- Late season flea beetle feeding
- Better than average yields

Pea to Marble Sized Hail - July 13

Hail Damage at CPC - July 14

Stem Breakage Canola

Stem Breakage Pigweed

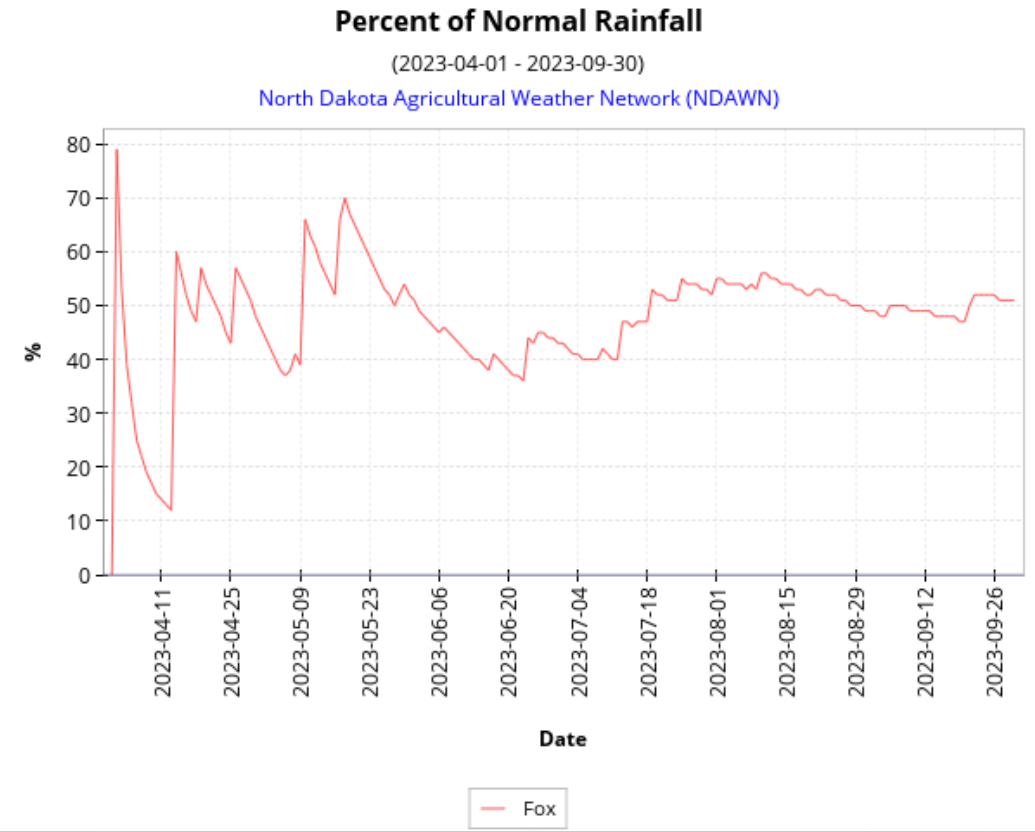
CPC Hail Damage August - 2023

Hail Damage - Stem Bruising

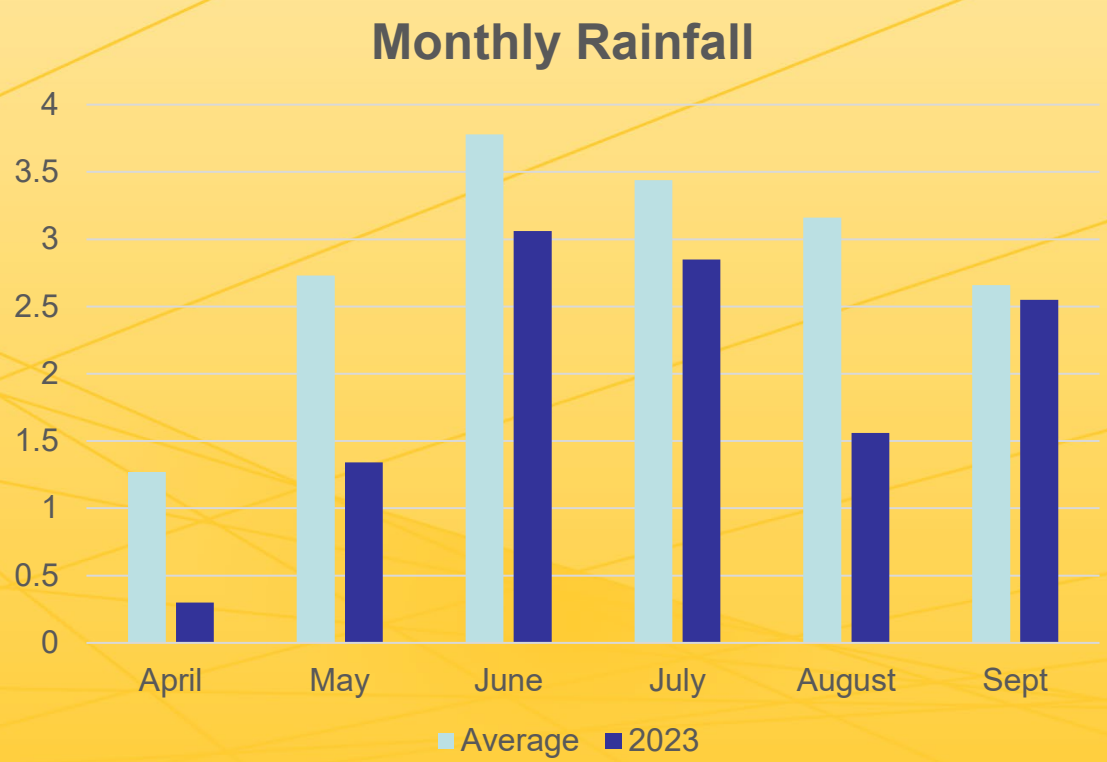
Hail Damage - Stem breakage

Percent of Normal Rainfall and Monthly Totals at the CPC in 2023

Percent of Normal Rainfall



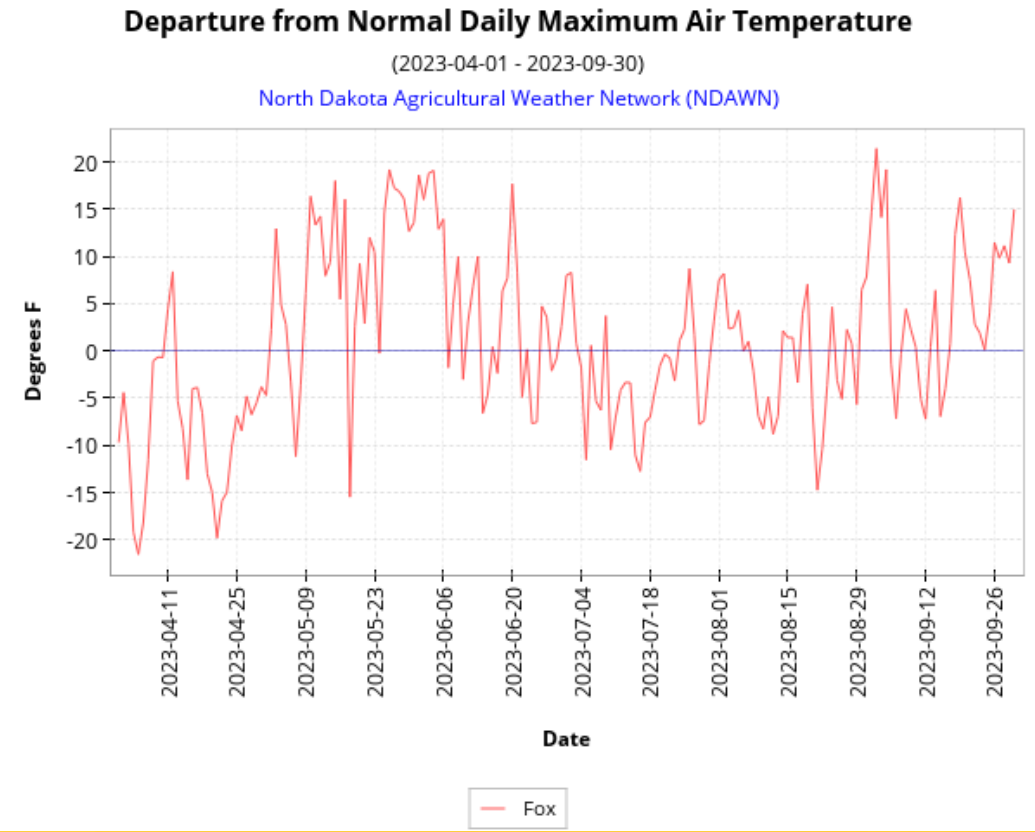
Monthly Rainfall at MN CPC



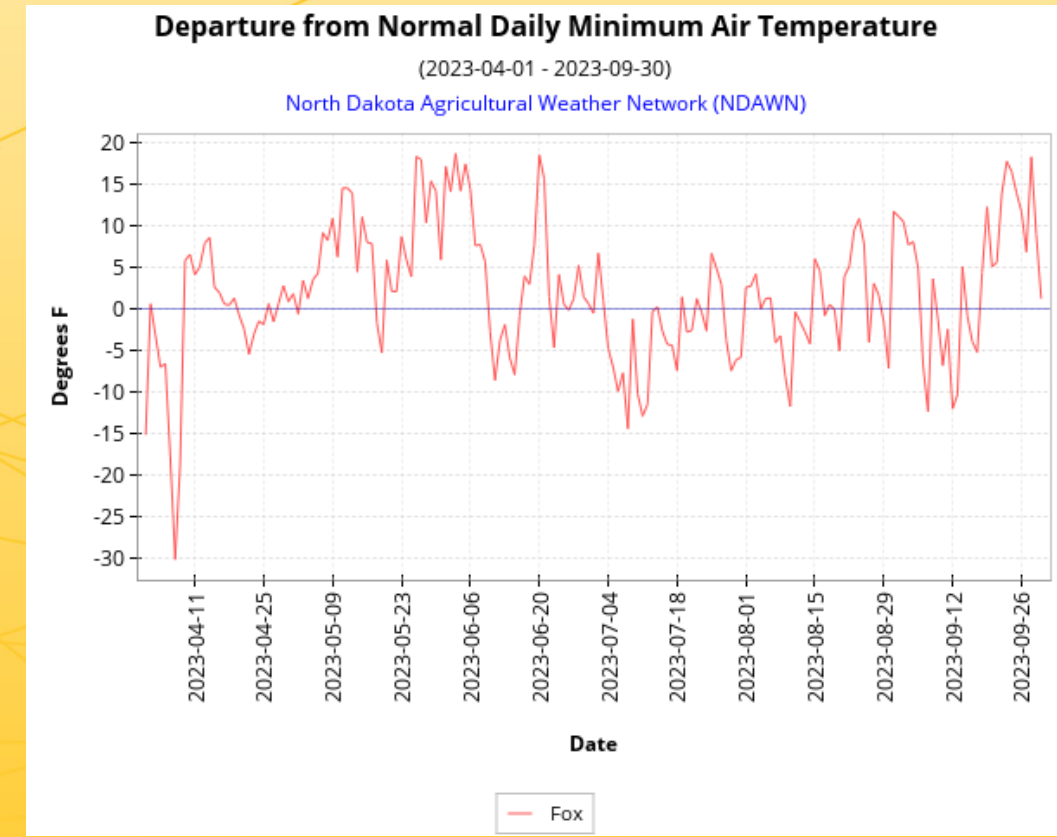
UNIVERSITY OF MINNESOTA

Daily Departure From Normal Max and Min Temperature at the CPC - 2023

Departure from Max Temp



Departure from Min Temp



Canola Variety Trial - Methods

- Fertilizer applied PPI - 140-20-30-20s
- Seeding rate: 10-12 PLS/ft^2 (PLS from seed companies)
- Seeding date: 5/23/23
- Warrior at 1.5 oz/ac applied on 6/10/23
- Proline at 5.7 oz/ac applied at first petal drop (30% bloom)
- Priaxor applied 7/18/23 after hail event on 7/13/23
- Swathing date: 8/22/23
- Harvest date: 9/8/23

Roundup and Truflex Canola Varieties - 2023

Ent#	Company	Variety	Herbicide Tolerance*	#/acre	Protein	Oil	Test wt./bu.	Lodging	Harvest Height (in)	% Ground Cover-21DAP	ESV-21DAP	Begin Bloom Date	End Bloom Date	Days of bloom
1	CROPLAN	CP9978TF	TF	3321	21.6	45.8	52.4	1.8	50	83	8.5	30-Jun	26-Jul	26
2	CROPLAN	CP9221TF	TF	3056	21.3	44	51.5	2.0	46	78	8.0	27-Jun	25-Jul	28
3	Pioneer	P515G	RR	3127	20.8	46	52.6	1.0	54	73	8.0	2-Jul	27-Jul	24
4	Pioneer	P511G	Opt. Gly	2777	21.4	44.8	52.0	1.0	54	78	8.5	2-Jul	24-Jul	21
6	Proseed	TR23127	TF	2831	22.7	43.8	52.9	1.5	52	60	6.0	3-Jul	1-Aug	28
7	Meridian Seeds	CS3100 TF	TF	2382	21.6	42.7	51.9	1.0	59	80	8.0	4-Jul	5-Aug	31
8	Nuseed	NC155 TF	TF	2572	23.2	42.7	53.0	1.0	50	80	8.5	29-Jun	28-Jul	30
9	Nuseed	NC471 TF	TF	2726	21.8	44	52.7	1.0	57	83	8.0	2-Jul	27-Jul	29
10	Nuseed	NC527CR TF	TF	2644	22.3	43.9	51.1	1.0	51	85	9.0	30-Jun	28-Jul	28
11	Star Specialty Seed	StarFlex	TF	3320	20	47.3	52.2	1.3	48	85	8.5	30-Jun	26-Jul	27
	RR/TF only		LSD @ 5% level	253	1.1	1.2	0.3	0.8	4	2	1	1	5	
			CV(%)	6.1	3.4	1.9	0.4	45.7	5.4	13.5	11.1	2.0	11.7	

Liberty Link Canola Varieties - 2023

Ent#	Company	Variety	Herbicide Tolerance*	#/acre	Protein	Oil	Test wt./bu.	Lodging	Harvest Height (in)	% Ground Cover-21DAP	ESV-21DAP	Begin Bloom Date	End Bloom Date	Days of bloom
12	Dekalb	DKTFLL21SC	TF+LL	2609	19.9	47.8	51.9	2.3	44	88	8.5	28-Jun	23-Jul	25
13	Dekalb	DKLL82SC	LL	2896	20.6	47	52.0	1.0	47	88	9.0	30-Jun	24-Jul	24
14	Dekalb	DKLL83SC	LL	2670	21.1	45.6	51.7	1.8	50	83	8.5	28-Jun	23-Jul	25
15	Meridian Seeds	CS4000 LL	LL	2526	20.4	46	52.7	1.5	53	80	8.5	2-Jul	25-Jul	23
16	CROPLAN	CP7250LL	LL	2584	21.5	44.7	52.2	1.0	55	80	8.0	2-Jul	29-Jul	27
17	BASF	InVigor L233P	LL	3072	20.7	44.3	51.5	1.5	54	83	8.5	2-Jul	25-Jul	23
18	BASF	InVigor L340PC	LL	2826	20.7	43	51.2	1.3	54	80	8.0	1-Jul	26-Jul	26
19	BASF	InVigor L343PC	LL	2711	19.8	44.5	51.3	1.5	58	83	9.0	2-Jul	25-Jul	24
20	BASF	InVigor L345PC	LL	2751	20.7	43.1	52.6	1.0	58	80	8.0	4-Jul	31-Jul	28
21	BASF	InVigor L350PC	LL	2584	20.6	45	52.5	1.0	62	78	8.0	7-Jul	3-Aug	24
	LL only		LSD @ 5% level	290	1.0	1.2	0.4	0.9	4	1	2	1	3	
			CV(%)	7.3	3.5	1.9	0.9	45.9	4.7	9.9	12.6	2.7	6.9	

Canola Variety Trial - Results

- Average yield (#/ac) was 2,800; RR = 2876; LL = 2,723
- Yields ranged from 2,382 - 3,321 #/ac
- LSD (0.05) for yield (#/ac): 253 RR and 290 LL
- CV (%) for yield: 6.1 RR and 7.3 LL
- Protein ranged from 19.8 - 23.2; Oil ranged from 42.7 - 47.8
- Average days of bloom for RR varieties = 27.2; LL = 24.9
- Most varieties tabled well; lodging ratings ranged from 1 to 2.3 on a scale of 1 = upright and 9 flat on the ground

Canola Shatter Trial - Methods

- Canola varieties submitted by seed companies
- Canola seeded in 12-inch rows @ 9PLS/ft^2 on 5/23/23
- Two collection pans, (7”x13”) put out on 8/22/23
- Canola VT harvested 9/8/23
- Seed collection date and (days after swathing)
  - 9-4 (13)
  - 9-12 (22)
  - 9-19 (29)
  - 10-2 (42)

Canola Shatter Pans Placed in Front and Back of Each Plot

Canola Shatter Trial

Canola Seed Shatter

Pod, Branches and Seed

Canola Shatter Trial - 2023

		Yield	% Seed	All Source Seed Loss			Total seed lost by date(#/acre)			
Variety	Company	lb/acre	Lost	Total	seed	pod	9/4	9/12	9/19	10/2
BASF	InVigor L340PC	2826	5.4	153	136	17	11	5	24	113
BASF	InVigor LR345PC	2751	5.9	163	124	39	27	4	18	113
BASF	InVigor L350PC	2584	10.9	281	181	99	53	7	46	175
Dekalb	DKTFLL21SC	2609	7.1	184	141	44	47	9	15	112
Dekalb	DKLL82SC	2896	7.3	212	169	43	40	3	16	153
Dekalb	DKLL83SC	2670	6.9	185	156	29	33	5	17	131
CROPLAN	CP7250LL	2584	6.2	160	128	32	45	12	26	77
CROPLAN	CP9978TF	3321	3.9	128	96	32	32	5	18	72
CROPLAN	CP9221TF	3056	4.9	149	125	24	38	8	18	86
Nuseed	NC155 TF	2572	8.6	220	173	48	51	18	48	104
Nuseed	NC471 TF	2726	20.9	571	394	176	168	33	106	264
Nuseed	NC527CR TF	2644	9.7	257	222	35	42	14	69	132
Star Specialty Seed	StarFlex	3320	4.9	162	128	34	33	9	38	83
Proseed	TR23127	2831	5.7	161	142	19	14	2	52	94
	LSD @ 5% level	266		146	121	64	69	9	27	130
	CV(%)	6.7		48	51	93	107	69	53	74

Canola Emergence in Shatter Trial
October 2, 2023

Low Seed Drop - Shatter Trial

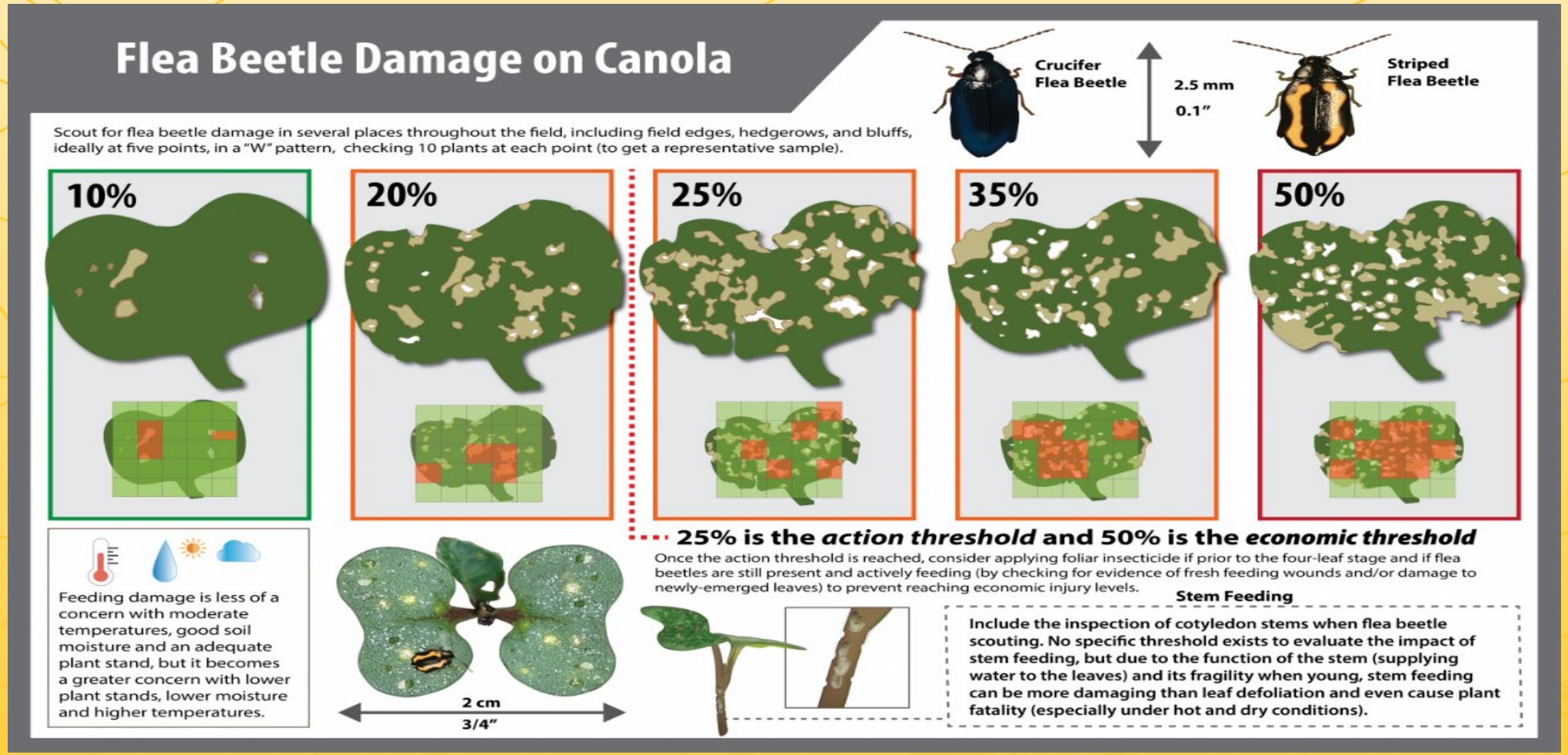
High Seed Drop - Shatter Trial

Shatter Trial Summary

- More pod drop early in 2023 compared to prior years
- 2023 was a hot and dry year
- Canola seed loss ranged from 128 to 571 #/ac (42 days after swathing)
- Percent seed loss ranged from 3.9 to 20.9
- In direct harvest, choose a variety that has good seed and pod shatter tolerance

Flea Beetle Population is a Blend of Striped and Crucifer Species

Flea Beetle Damage - Canola Council Canada



Flea Beetles in 2023

Cotyledon Stage

Meristem Feeding

High Flea Beetle Feeding Pressure

No Seed Treatment

High Flea Beetle Pressure

Canola Seed Treatment Trial - Methods

- Canola variety: DKTFLL SC
- Cooperative trial with NDSU
- Two trials - Seed Trt and foliar only, both located at CPC
- Trial design RCDB with 4 reps
- Seeding rate 12 pls/ft2
- Trials seeded 5/24 and harvested 9/7
- Flea beetle infestation were high to very high
- Marble sized hail with wind gusts to 50 mph on 7/13

Canola Flea Beetle Seed Treatment and Foliar Insecticide Trials - 2023

Seed Treatment Trial

Treatment	#/acre
Fungicide Check	1878
Helix Vibrance @ 23	2472
Helix Vibrance @ 23 + Fortenza @ 10.2	3044
Helix Vibrance @ 23 + Fortenza @ 15.4	2939
Helix Vibrance @ 23 + Fortenza @ 20.5	2723
Helix Vibrance @ 23 + Fortenza @ 10.2 + Brigade 2EC @ 2.6	3022
Prosper Evergol @ 21.5	2737
Prosper Evergol @ 21.5 + Lumiderm @ 9.8	2710
Prosper Evergol @ 21.5 + Lumiderm @ 14.8	2794
Prosper Evergol @ 21.5 + Lumiderm @ 19.7	2356
Prosper Evergol @ 21.5 + Lumiderm @ 9.8 + Brigade 2EC @ 2.6	2983
Prosper Evergol @ 21.5 + Buteo Start @ 9.6	2620
Prosper Evergol @ 21.5 + Buteo Start @ 16	2563
Prosper Evergol @ 21.5 + Buteo Start @ 9.6 + Lumiderm @ 9.8	2508
Prosper Evergol @ 21.5 + Buteo Start @ 9.6 + Brigade @ 2.6	2795
LSD @5% level	310
CV(%)	8.1

Foliar Insecticide Trial

Treatment	Rate	#/acre
Untreated check		1869
Helix Vibrance seed trt	23 fl oz	2443
Brigade 2EC	2.6	2141
Ridgeback	5.5	2017
Vantacor	2.5	1877
Exirel	7	1945
Delta Gold	0.8	2097
Warrior II	1.92	1939
Mustang Maxx	4	1926
Plinazolin	0.5	1777
Plinazolin	1	1901
Plinazolin	1.5	1919
Brigade 2EC	2.6	1921
LSD @5% level		313
CV(%)		11

Late Season Flea Beetle in 2023

Flea Beetles on Canola Pods

Canola Pod Feeding

Late Season Flea Beetle Feeding Canola Council of Canada

Flea Beetle Pod Feeding

High Flea Beetle Pressure

Canola Seed Treatment Trial - Results

- All seed Trts increased seed yield > 300/#ac compared to the fungicide check
- Fortenza at 10.2 and 15.4 oz combined with Helix Vibrance increased seed yield by > 467 #/ac than Helix Vibrance alone
- No differences in seed yield from Proper Evergol alone (2,737 #/ac) compared combinations of Prosper Evergol with Lumiderm or Buteo Start
- Foliar treatments applied late which confounded the data
- Late season flea beetle pressure becoming more common

A Uniform Stand of Canola Generally Will be Competitive with Weeds

Conditions Favorable to Weeds

- Erratic emergence and stand establishment
- Low areas in field
- Drought prone areas
- Compacted zones
- Delayed post emergence herbicide applications
- Hail damage

Lambsquarters, Smartweed, Thistle

Difficult to Control Weeds

Common Lambsquarters

Tall Waterhemp

Soil Applied Herbicides in Canola

- Trial objective is to evaluate potential soil applied herbicides for control of late season weeds in canola
- Tall waterhemp, Palmer pigweed, redroot pigweed and barnyardgrass are examples of weeds that tend to germinate later in the season
- Products evaluated include:
  - Spartan, Sonalan and Treflan

Soil Applied Herbicides 2022 and 2023

Canola Yields

TRT	Treatment	Soil applied	#/Acre 2023	#/Acre 2022	Protein[2]	Oil[2]	Test wt./bu.
1	Liberty Only		2969	3382	20.1	43.6	50.7
2	Spartan	2 oz. PRE	2716	2588	20.3	43.2	51.1
3	Sonalan HFP	2PT PPI	2812	3123	20.1	43.5	50.9
4	Trust(Treflan)	1.5PT PPI	2589	3133	20.2	43.5	50.8
		LSD @ 5% level	328	406	NS	0.4	0.3
		CV(%)	7.4	8.0	1.9	0.6	0.3

Summary of Results

- Trial kept weed free by hand weeding
- In 2022, yield reduction from Spartan (794#) compared to Liberty alone
- In 2023, yield reduction from Treflan (380#) compared to Liberty alone

Soil Applied Herbicides in Canola - Results

- Plots kept weed free by hand weeding
- Liberty alone generally highest yield in trials
- Spartan at 2 oz/ac applied PRE reduced canola yield by 794 #/ac compared to Liberty alone in 2022
- Treflan at 1.5 pt/ac PPI reduced canola yield by 380 #/ac in 2023
- Sonalan similar yields as Liberty alone in both years
- Trial should be conducted in fields with a tendency for late season with weed pressure and with RR varieties

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?

Winter Canola - Oct 2021

Winter Canola: U of MN Magnusson Research Farm - Spring of 2022

Winter Canola - May 11

Winter Canola - June 3

UNIVERSITY OF MINNESOTA

Winter Canola at St. Paul, MN

April 17, 2023

June 6, 2023

Winter Canola Variety Trial - 2023

Winter Canola VT- St. Paul 2023

Variety	Yield[1] (#/acre)	Plants/ Ft.2 Harvest	First Bloom Date
CP1066WC	**2153**	5.0	14-May
Torrington	**2234**	5.8	12-May
Mercedes	**1958**	4.4	11-May
Plurax CL	**1964**	5.1	10-May
LSD @5%	NS	1.3	1
CV(%)	17.4	16.5	6.8

Experimental Design:RCB w/ 4reps

Planted 8/26/22 in 6" rows at 9PLS

60-0-0-20S applied 4/26/2023

Reglone applied 6/26/2023 as pre harvest aid

Combine height=24-28" harvested 6/29/2023

Winter Canola Summary from 2021 to 2023

- In 2022 at Roseau, 100% stand loss
- In 2023 at Roseau, canola survived but yields < 600 #/ac
- In St. Paul in 2023, canola survived the winter harvested yields ranged from 1,958 to 2,234 #/ac
- New winter canola genetics gave better yields in St. Paul than Roseau. Environmental conditions in northern MN may be too harsh for winter canola with current genetics.

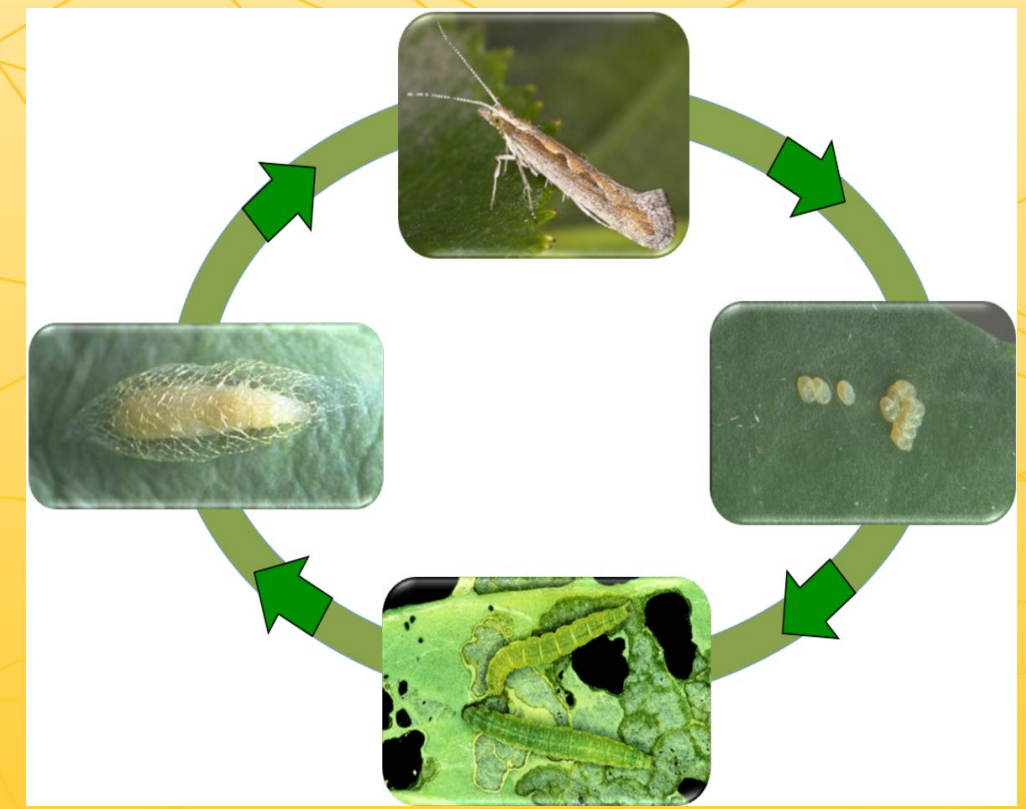
Insect Surveys in 2023

- Bertha Armyworm
- Diamondback Moth
- Canola Flower Midge
- Swede Midge

- Selected field observations of late season flea beetle

Diamondback Moth and Bertha Armyworm - Lifecycles

Diamondback Moth



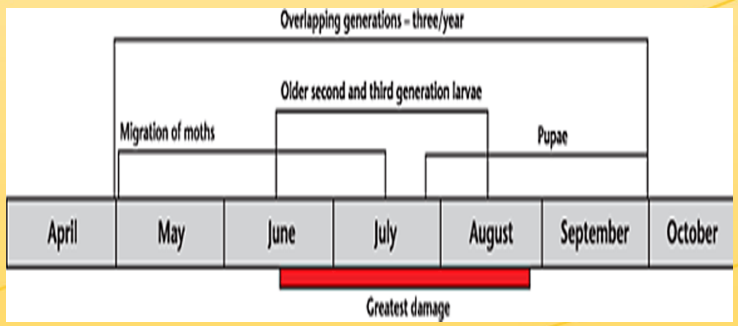
Bertha Armyworm

Diamondback Moth (Plutella xylostella L.)

Susceptible Crops

- canola
- mustard
- cabbage
- cauliflower
- broccoli
- kale

Multivoltine (more than generation)



Diamondback Moth - Pictures Canola Council of Canada

Diamondback Moth - Adult

Diamondback Moth - Pod Feeding

Diamondback Moth Feeding in MN 2023

DBM - July 2

DBM - Aug 1

Diamondback Moth Pod Feeding

Missing/Damaged Canola Seeds

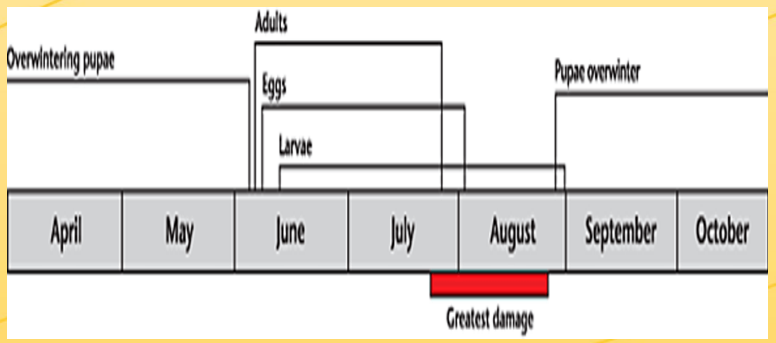
Pod Feeding - Aug 1, 2023

Bertha Armyworm (Mamestra Configurata Wlk.)

Susceptible Crops

- Canola
- Mustard
- Lambsquarters
- Flax
- Peas
- Potatoes
- Cole Crops

One Generation/year



Bertha Armyworm Larvae

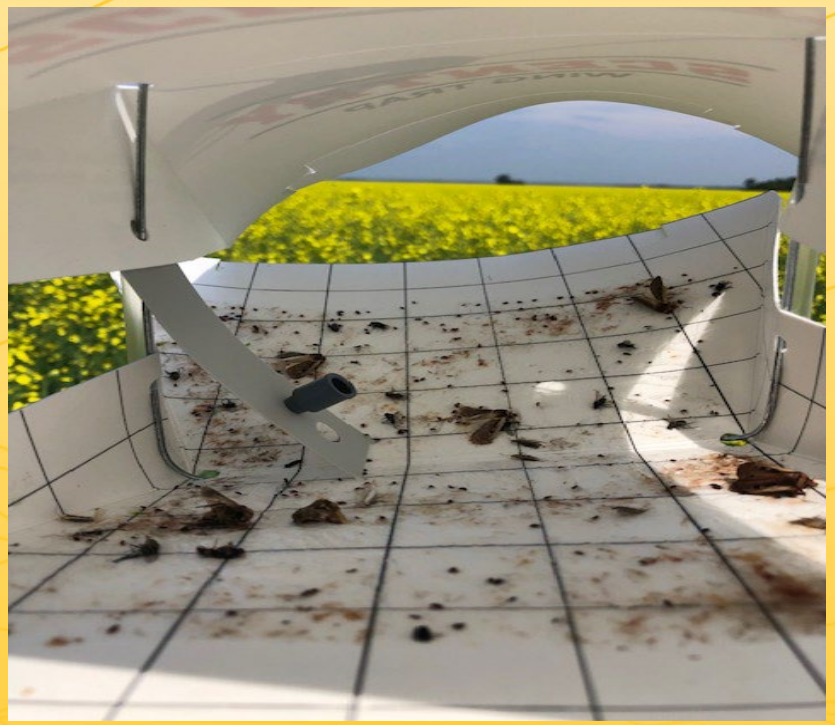
Larvae

Bertha Armyworm - Aug 3

Diamondback Moth Survey - 2023

Diamondback Moth Trap

Closeup Diamondback Moth Trap



Bertha Armyworm Survey - 2023

Bertha Armyworm Trap

Moths Collected in Trap

Bertha Armyworm and Diamondback Moth Trapping at Two Locations in - 2023

Magnusson Farms

Location		Bertha Armyworm	Diamondback Moth	Growth stage
Magnusson Farm-	3-Jul	0	4	first bloom
	10-Jul	1	38	mid-flower-lower pods elongating
	14-Jul	5	5	lower pods starting to fill
	21-Jul	62	48	end flowering, seed enlarging in lower poc
	28-Jul	48	27	seed in lower pods green
	4-Aug	8	58	seed in lower pods green-yellow
	11-Aug	4	57	seed in lower pods yellow or brown
Total insects trapped 6/23 - 8/		128	237	

Northern Resources

Location		Bertha Armyworm	Diamondback Moth	Growth stage
Northern Resources	3-Jul	0	0	first bloom
	10-Jul	1	19	mid-flower-lower pods elongating
	14-Jul	1	8	lower pods starting to fill
	21-Jul	8	27	end flowering, seed enlarging in lower pods
	28-Jul	16	17	seed in lower pods green
	4-Aug	14	15	seed in lower pods green-yellow
	11-Aug	16	22	seed in lower pods yellow or brown
Total insects trapped 6/24 - 8/		56	108	

Summary Diamondback Moth and Bertha Armyworm Trapping in 2023

- Pheromone traps were effective in trapping moths
- More moths collected at Magnusson Farms compared to Northern Resources
- The highest number of moths collected in mid-July to early August timeframe
- Both Bertha armyworm and Diamondback moths larvae observed on canola fields in northern MN
- Trapping project will continue in 2024

Questions

Contact Information

- Dave Grafstrom
- Email - Grafs010@umn.edu
- Cell: 320-293-8722

- Minnesota canola research reports are posted on the MN Canola web site: mncanola.org