Insect and Disease Issues in Canola

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Photo Credit: Bayer Crop Science, Canada

Canola Flea Beetles

Importance of Flea Beetles

- The most serious early season insect pests on canola
- Cause significant damage to canola seedlings (Cotyledon to 4 leaf stage)
- Control costs > 300 million dollars annually in North America
- Seed treatments are the primary method of control
- 95% of the canola seed is treated with neonicotinoids
- Heavy reliance on neonics lead to resistance issues
- Striped fbs are more tolerant to neonics than crucifer fbs (Tansey etal., 2008, 2009)

Crucifer flea beetle
Phyllotreta cruciferae

- Most abundant species
- Emerges later than striped
- Easy to control

Striped flea beetle
Phyllotreta striolata

- Less abundant species but increasing in numbers
- Emerges 1-3 weeks early in season
- Tolerant to neonic seed treatments

Canola Flea Beetle Life Cycle

Overwinter

Late Summer Adults

Spring Adults

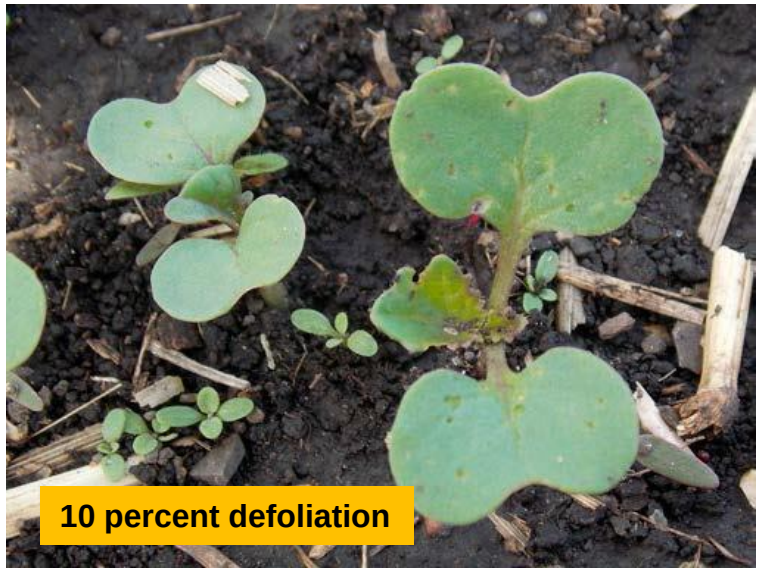
Eggs

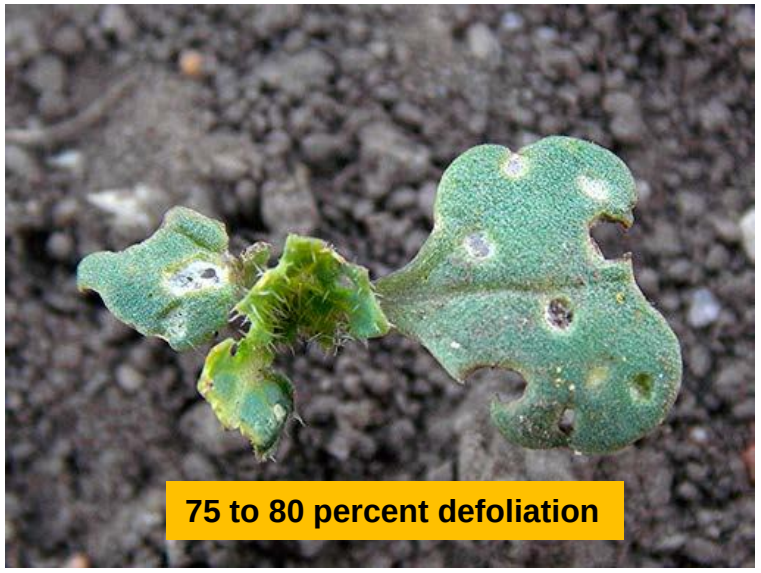
Larva

Pupa

(Photo credit: L. Harris, AgView International Inc., Saskatchewan, Canada)

Integrated Pest Management of Flea Beetles- Foliar Spray





Integrated Pest Management of Flea Beetles

- Planting date
- Large seed
- Resistance breeding- Hairy canola
- Insecticides

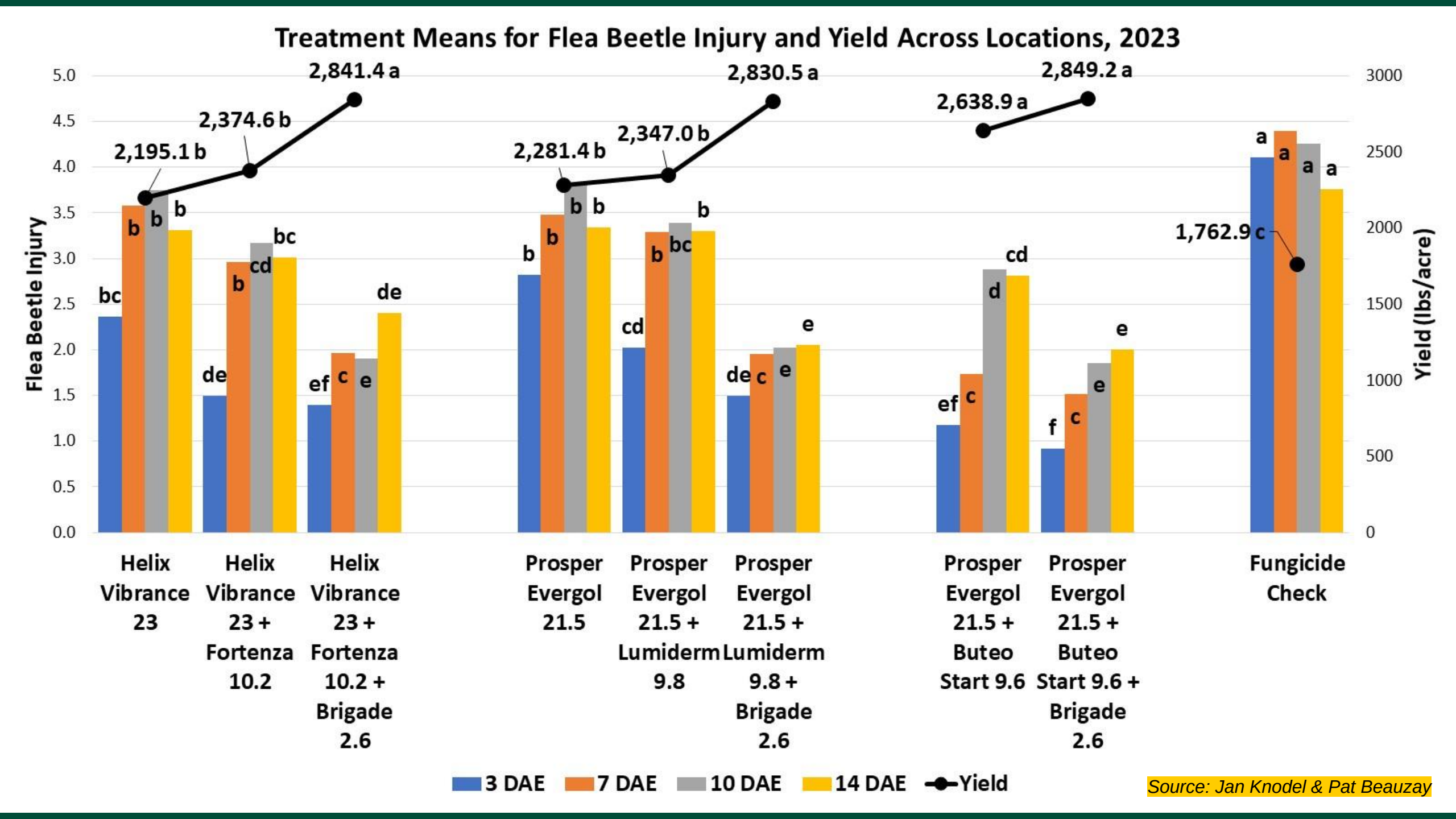
Insecticide Active Ingredients

Product	Chemical Class (IRAC)	Active Ingredient	Commercial Rate	AI Rate (metric)
Helix Vibrance	Neonicotinoid (4A)	Thiamethoxam	23 fl oz per cwt	404 g ai per 100 kg
Prosper Evergol	Neonicotinoid (4A)	Clothianidin	21.5 fl oz per cwt	406 g ai per 100 kg
Lumiderm	Diamide (28)	Cyantraniliprole	9.8 fl oz per cwt	400 g ai per 100 kg
Fortenza	Diamide (28)	Cyantraniliprole	10.2 fl oz per cwt*	400 g ai per 100 kg
Buteo Start	Butenolide (4D)	Flupyradifurone	9.6 fl oz per cwt	300 g ai per 100 kg
Brigade 2EC	Pyrethroid (3A)	Bifenthrin	2.6 fl oz per acre	18.4 g ai per acre

Source: Jan Knodel & Pat Beauzay

RESULTS

NDSU



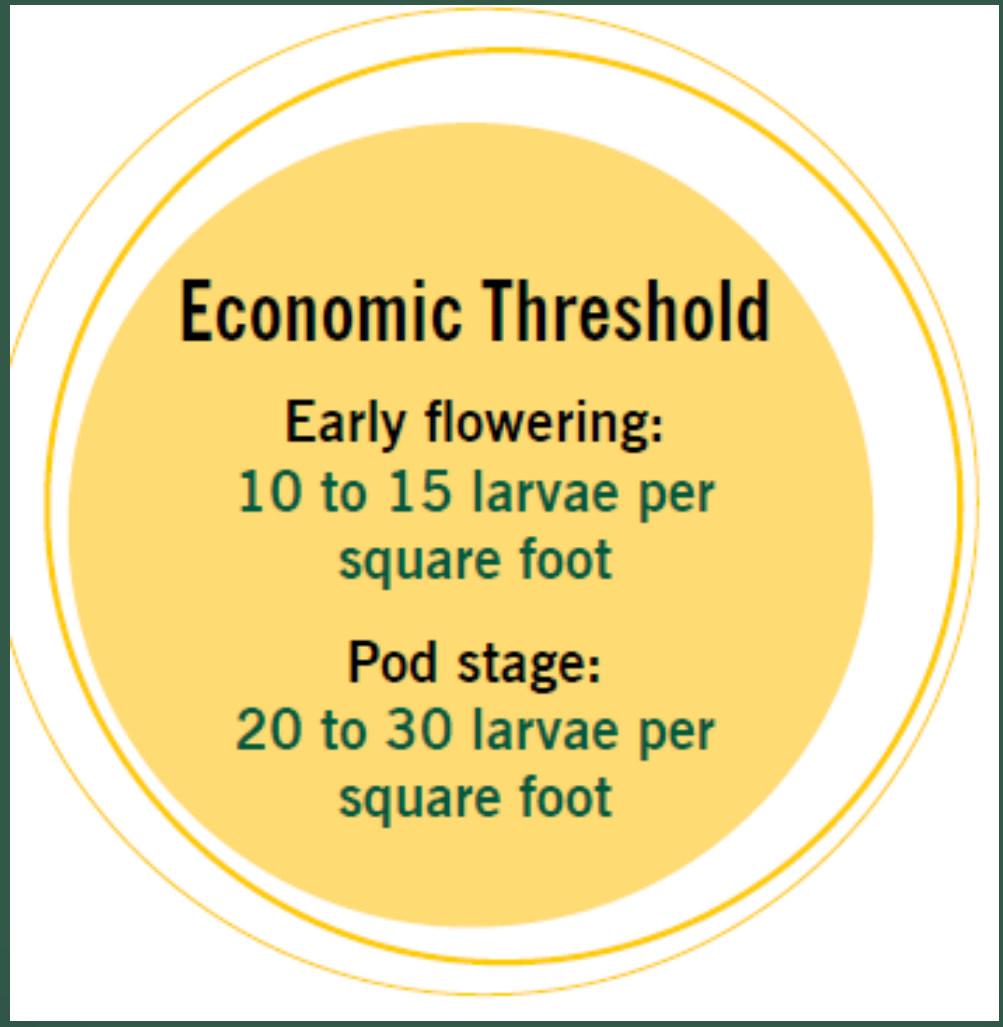
Source: Jan Knodel & Pat Beauzay

Diamondback Moth

(*Plutella xylostella* L.)

DBM Larval Feeding Injury

Diamondback Moth



Aster Yellows

(Candidatus Phytoplasma asteris)

Aster leafhopper adult

(P. Beauzay, NDSU)

Photo: Adam Varenhorst, SDSU Extension)

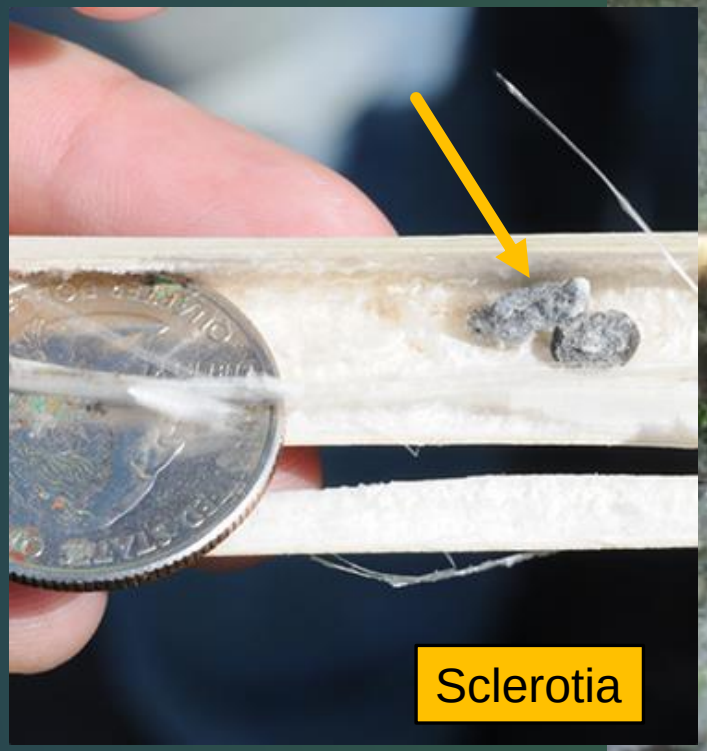
White Mold (*Sclerotinia sclerotiorum*)

Photo Credit: Luis del Rio Mendoza, NDSU

Photo Credit: Govt. of Western Australia

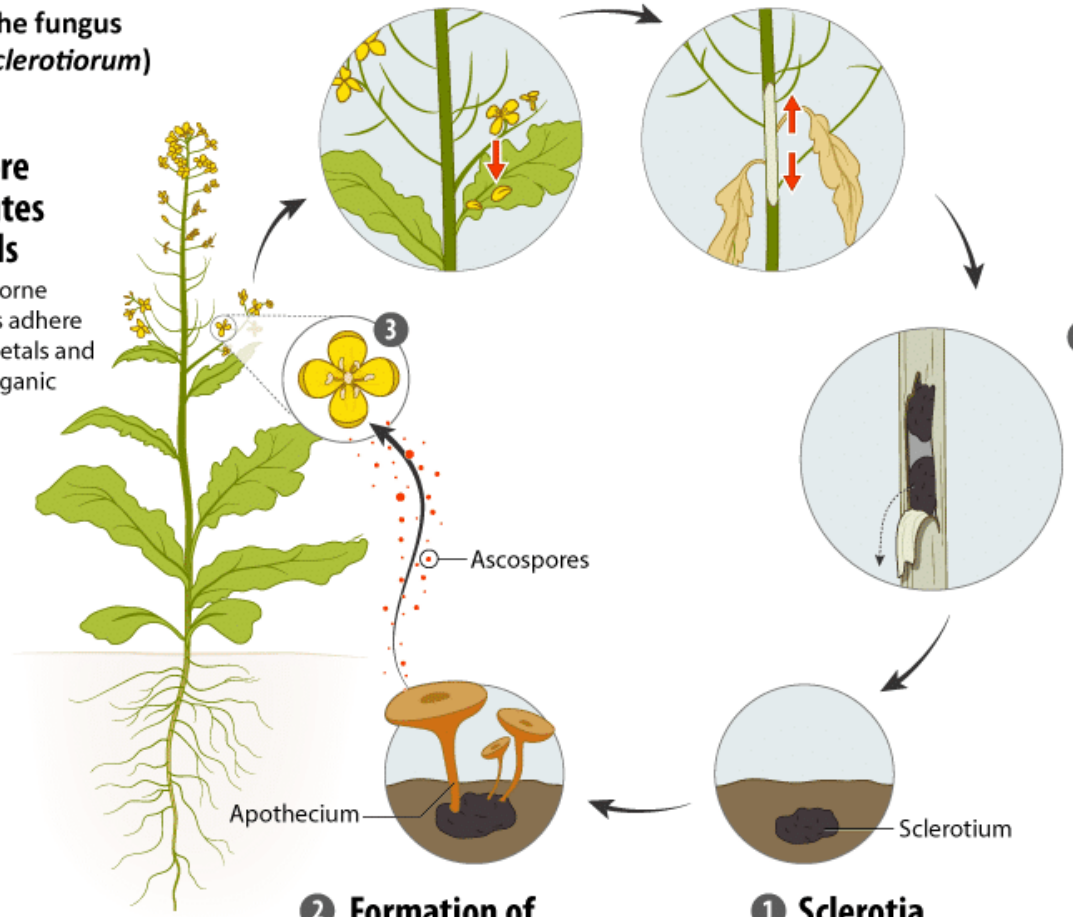
Source: Canola Council of Canada

White Mold (*Sclerotinia sclerotiorum*)



Sclerotinia Stem Rot Disease Cycle

(Caused by the fungus *Sclerotinia sclerotiorum*)



1 Sclerotia Overwinter in Soil

The stem rot fungus (*Sclerotinia sclerotiorum*) overwinters as sclerotia in the soil or in stubble at the soil surface.

2 Formation of Apothecia

Spore-producing apothecia germinate from sclerotia under moist plant canopy and release ascospores.

3 Ascospore Distributes on Petals

The windborne ascospores adhere to flower petals and or other organic material.

4 Germination and Distribution of Infection

Ascospores germinate, infect the petal, and spread to adjacent tissues of healthy leaves and stems by direct contact.

5 Distribution of Fungal Lesion

The lesions progress up and down the stem. At this stage, wilted leaves can be visible.

6 Formation of New Sclerotia

The infected stem becomes bleached and brittle and forms new sclerotia. The sclerotia return to the soil at harvest and the cycle repeats.

Source: Canola Council of Canada

Photo Credit: Bayer Crop Science, Canada

Photo Credit: Bayer Crop Science, Canada

Source: Canola Council of Canada

Photo Credit: Govt. of Western Australia

*Do follow the risk map generated by NDSU, NDWAN and NCGA to make a decision of spray

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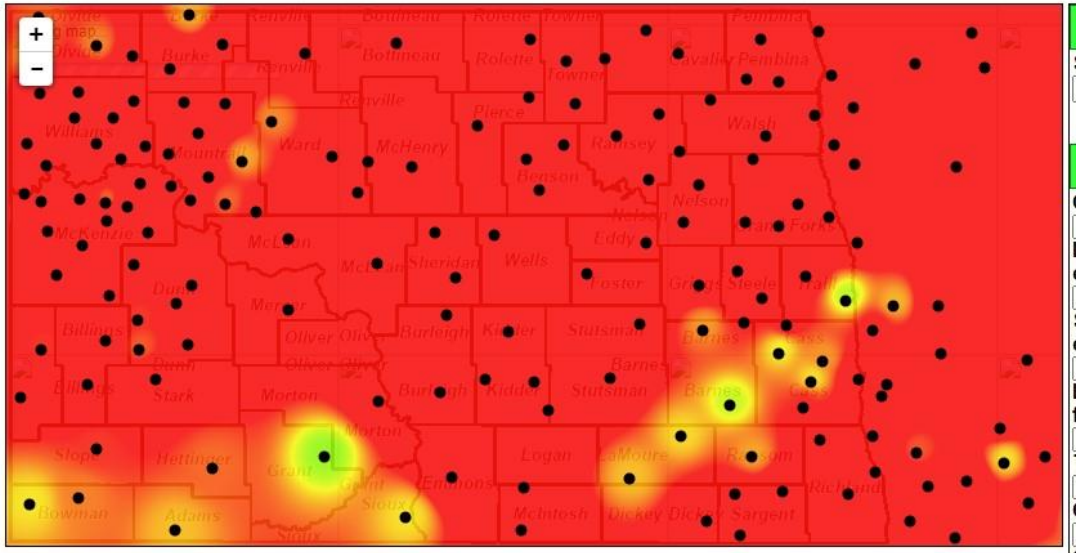
CANOLA PATHOLOGY

Estimated risk of Sclerotinia stem rot development for 7/2/2024



Previous risk maps

Select date:

Get Map

Risk calculator

Closest NDAWN Station:

Last time planted to canola:

Sclerotinia on last canola:

Last year's crop in this field:

Tillage last year:

Canola Row Spacing:

Canola type:

Date of Planting:

Calculate Risk

•NDAWN Station
Low Risk
Intermediate Risk
High Risk

Estimation of the risk of sclerotinia stem rot development is based on temperature and precipitation patterns prevalent in the region as recorded by NDAWN stations. Areas where conditions are favorable for infection are presented in red; If apothecia are prsent in these fields fungicide applications may be warranted. Fields in yellow areas should be scouted for apothecia and changing weather conditions. Fields in green areas have low risk of disease development. The estimation of risk applies to canola fields that are in the flowering period only.

https://www.ag.ndsu.edu/sclerotinia/riskmap.html

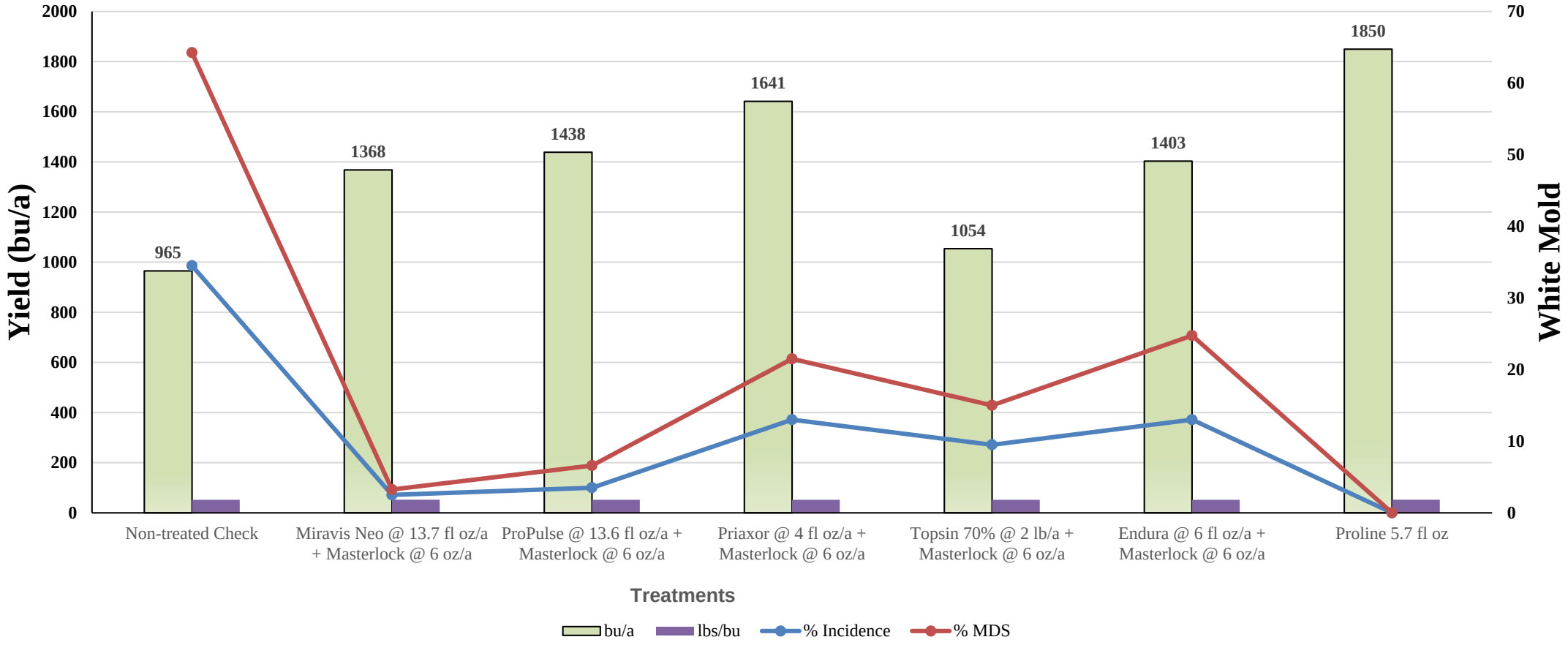
Risk Factors

- Previous infestation in the field
- Short crop rotation
- Rain in the last two weeks and during flowering

When to Spray??

At 20% to 30% bloom

White Mold Fungicide Field Trial Results

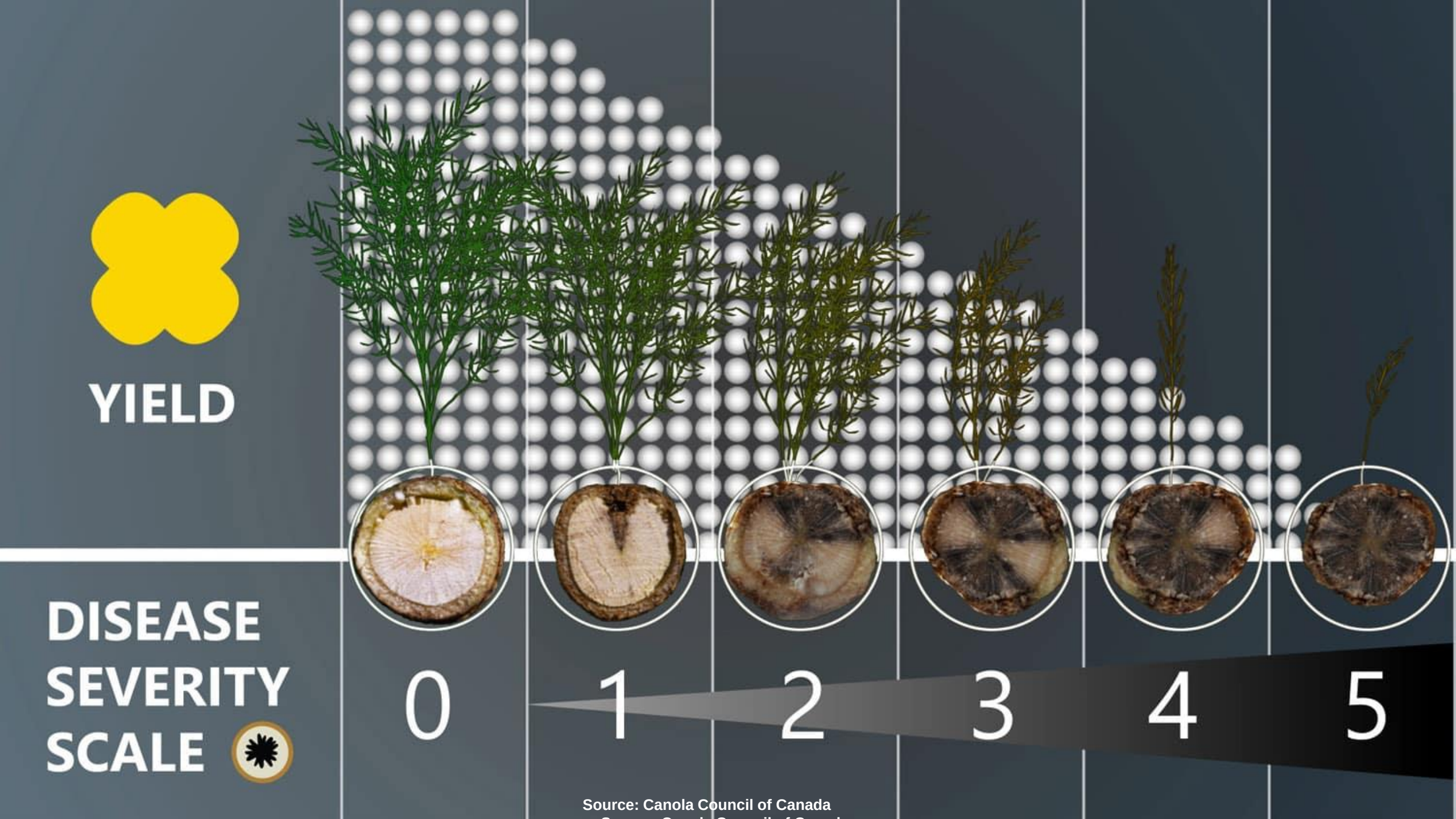


Cultivar: DKL DKTFLL21SC

Blackleg (*Leptosphaeria maculans*)

- A stubble-borne fungus
- Yield loss is greatest when blackleg infects in the early growing stages prior to the six-leaf stage
- If severe infection occurs, yield loss can be up to 50%

Source: Canola Council of Canada



Source: Canola Council of Canada

Management of Blackleg in Canola

- Longer crop rotations
- Rotate Resistant Cultivars
- Seed treatments
- Foliar spray at 2- 4 leaf stage (Quadris etc)

Selection of Resistant Cultivars

In Canada

BASF blackleg solutions.

All InVigor hybrids are rated 'R' for resistant to blackleg. This resistance rating is given to a hybrid by comparing their blackleg sensitivity to a susceptible variety. Relative ratings are based on the information provided in this table—with Westar being the susceptible check variety.

FIELD RESISTANCE RATING	% DISEASE SEVERITY OF WESTAR
R (Resistant)	0-29
MR (Moderately Resistant)	30-49
MS (Moderately Susceptible)	50-69
S (Susceptible)	70-100

Resistance Group	Major Resistance Gene*
A	Rlm1 or LepR3
B	Rlm2
C	Rlm3
D	LepR1
E_1	Rlm4
E_2	Rlm7
F	Rlm9
G	RlmS
H	LepR2
X	unknown

Table 2. Major gene resistance groups for blackleg attacking canola. Courtesy of the Canola Council of Canada.

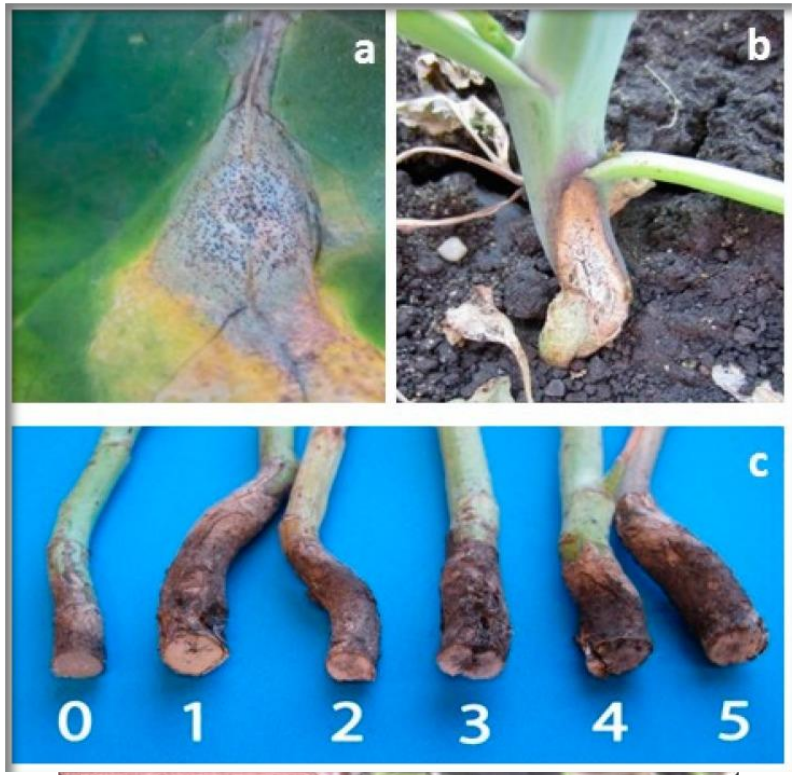
*Remember to rotate the cultivars

*Future research to identify the Pathogenicity Group present in the growers Fields

Blackleg Seed treatment Results-2023

		Blackleg on Canola		Yield	Test Weight
Seed Treatments	Plant Stand	% Incidence	% Severity	(lbs/a)	(lbs/bu)
Experimental	18	36	29	3485	51.7
Saltro	18	45	45	2795	52.3
Evergol Energy	17	41	42	2898	52.4
Intego Solo	16	31	33	2579	52.6
Rancona Summit	19	35	42	2722	52.3
Trilex	24	38	28	2669	52.4
Non-Treated	18	53	50	2790	52.3
Mean	**18**	**40**	**39**	**2848**	**52.3**
CV%	**22.0**	**21**	**39**	**9**	**0.5**
LSD	**6**	**13**	**NS**	**365**	**0.4**
P-Value (0.05)	**0.0041***	**0.0321***	**NS**	**00.15***	**0.0094***

Cultivar: InVigor L233P
RCBD Replicated 4 times



Blackleg Seed Treatment Results-2024

Treatments	Plant Stand	Phytotoxicity	Vigor	Blackleg		Yield	Test Wt.
	3ft/row	(0-9)	(1-5)	% Incidence	% Severity	(lbs/A)	(lbs/bu)
Experimental	24	0.3	2	46	26	2642	51
Saltro	20	0.0	2	41	20	2066	51
Evergol Energy	16	0.5	2	57	34	1874	52
Intego Solo	17	0.0	2	51	24	2077	52
Rancona Summit	15	0.3	2	42	23	1873	52
Trilex	19	0.0	2	61	37	1894	52
Non-Treated	16	0.0	3	71	43	1563	52
Mean	**18**	0.14	2.04	**53**	**29**	**1998**	**51.5**
CV%	**30**	211	14.84	**17**	**24**	**11**	**0.4**
LSD	**8**	0.45	0.45	**14**	**11**	**314**	**0.3**
P-Value (0.05)	**NS**	**NS**	**NS**	**0.0018***	**0.0024***	**0.0001***	**0.0034***

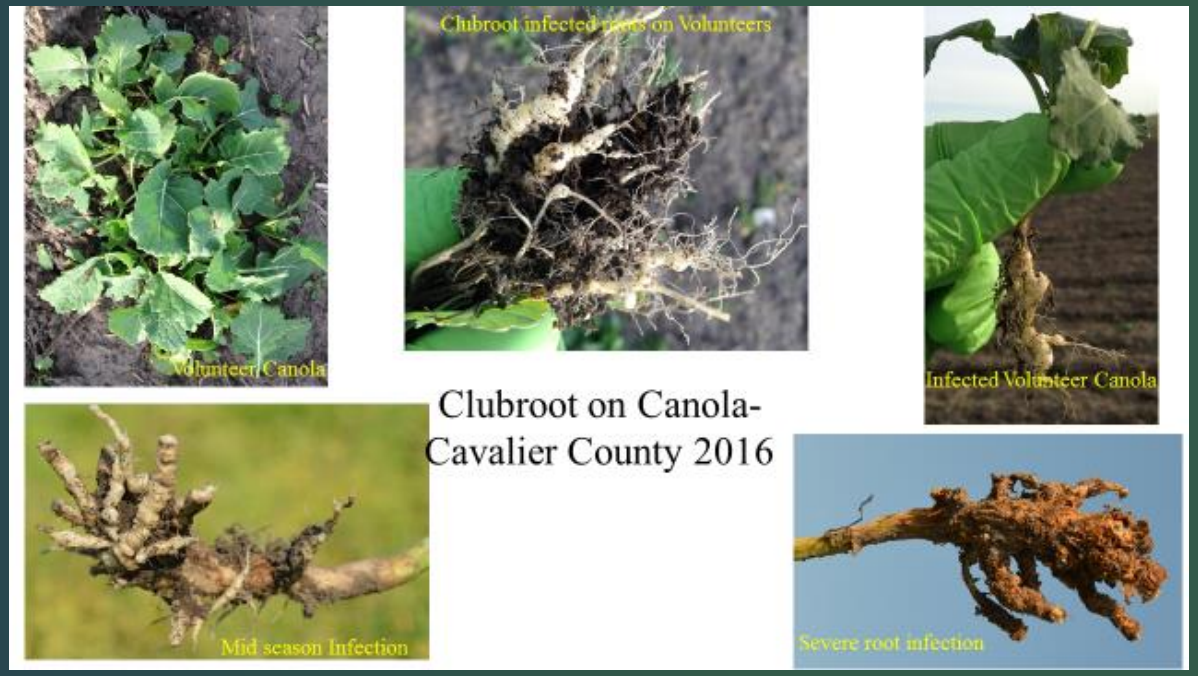
Clubroot (*Plasmodiophora brassicae)*

- Pathogen belongs to lower group of living organisms called Protista
- Not a fungus/amoeba/slime mold
- A serious yield robing disease of brassica crops
  - Canola, cauliflower, cabbage, rutabaga, radish, turnip, brussel sprouts, kale etc.
  - Brassica weeds: wild mustard, shepard's purse, penny cress, stink weed
- Prefers acidic soils but found in the soils of pH up to 7.2
- Once in the soil can live as resting spores up to 20 years
- Pathogen infects roots; causes galls there by restricting the flow of water and nutrients to the plant
- If 100% of plants infected results in 50-80% reduction in yields (Europe and Sweden Research)

Wilting symptoms at early flowering

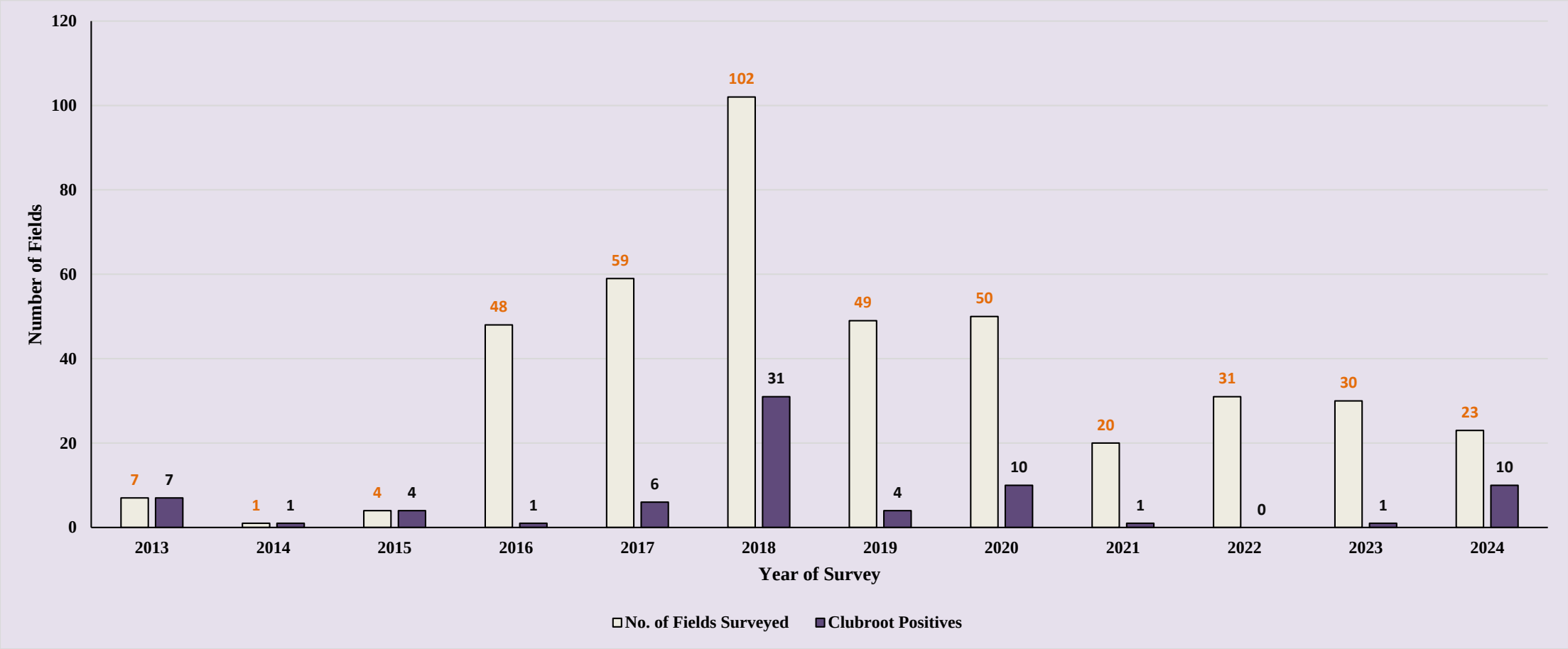
Patches in the standing crop

Clubroot symptoms can bee seen in field right after 45 days of planting

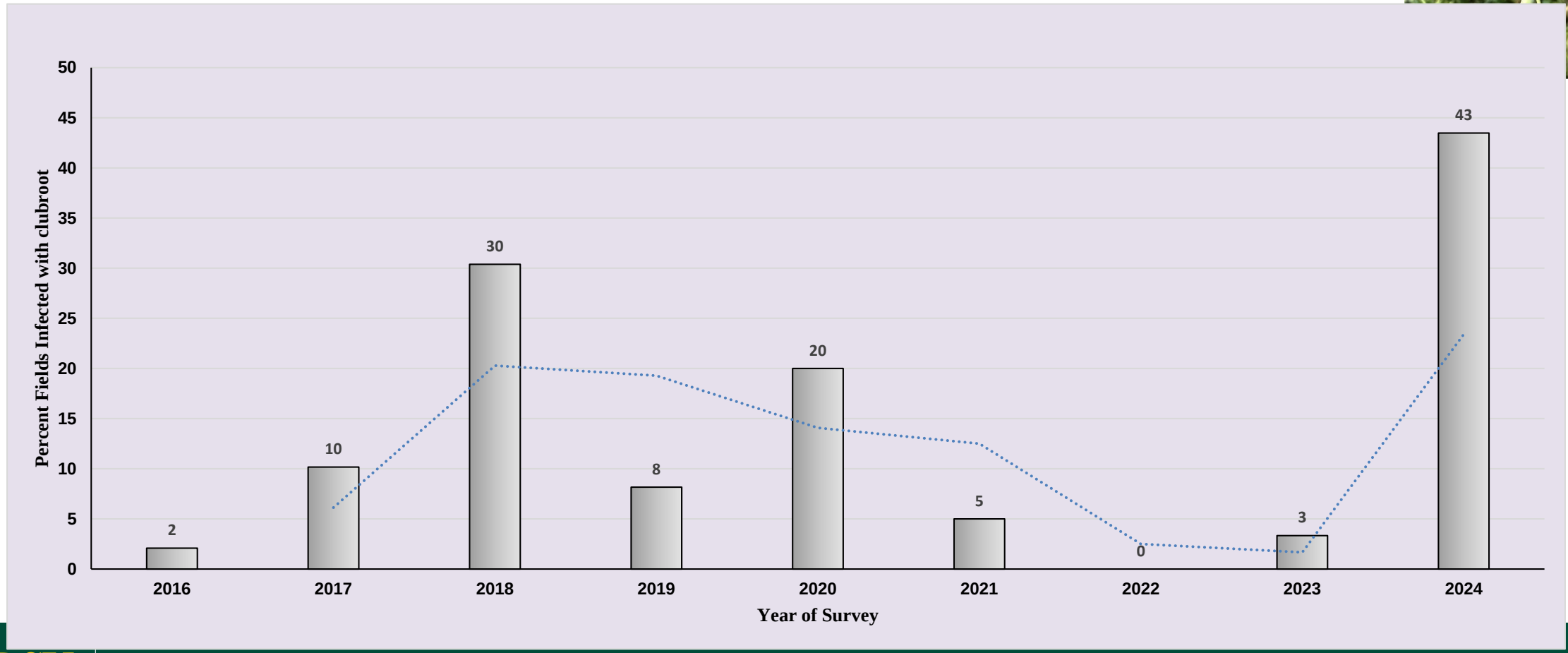


Yield Losses?

Clubroot Survey Results (2013-2024)



Clubroot Survey Results-2024



Rotate Crops to Manage Clubroot

- Canadian-based research has found that switching from a one-in-two to a one-in-three-year rotation can drop spore loads by 90 per cent.

- Canola- Wheat-Field Pea/Soybean/Sunflower/Dry bean -Wheat-Canola

- Use of Resistant cultivars highly recommended with cultivar rotation

Clubroot Survey Results-2024

(First Report of Break Down of Clubroot Resistance in North Dakota)

A breakdown occurs when a variety rated "R" has unexpectedly high levels of infection.

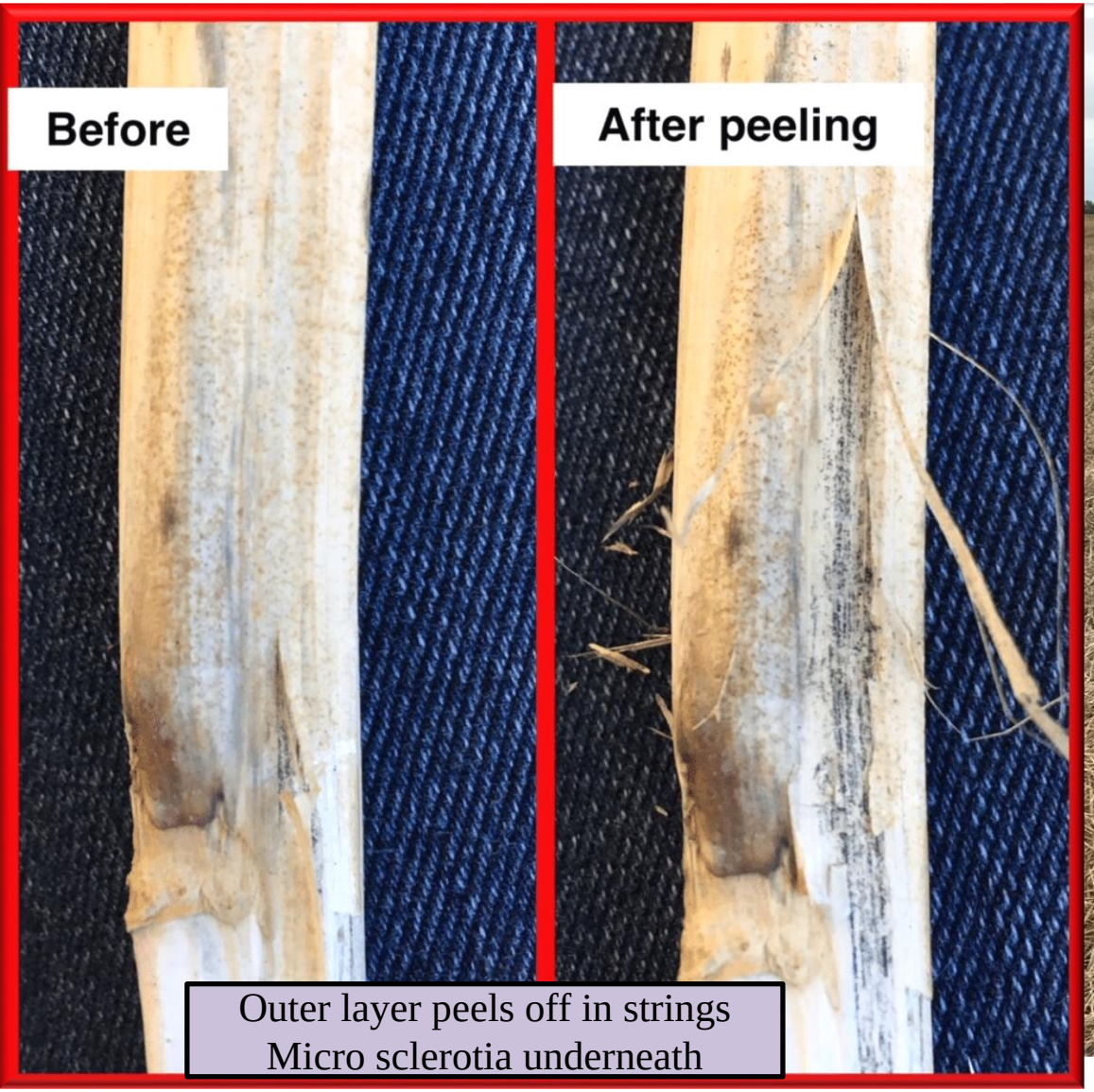
Clubroot Resistance Breakdown-2024

Cultivar Characteristics (Clubroot Resistant Types)	Herbicide Trait	Level of Clubroot Damage
First Generation	LibertyLink +RoundUp Ready	Severe (100% DSI) /Heavy Losses
CR4	LibertyLink	Severe (100% DSI) in Patches
Resistant to Currently Predominant Pathotypes	LibertyLink + RoundUp Ready	Severe (100% DSI) in Patches
Next-generation	LibertyLink	Found galls in low levels (5% DSI)

New Canola Disease-Verticillium Stripe

Courtesy: Canadian Canola Council

- Caused by a *Verticillium longisporum*
- Infects brassica crops mostly
- Yield losses between 10 to 50%



Outer layer peels off in strings
Micro sclerotia underneath

Lodging

- Verticillium and blackleg symptoms can be seen on the same plant
- Interaction between *L. maculans &V. longisporum* may cause more severe losses in canola

Verticillium Stripe Management

- Longer Crop Rotations
- No resistant Varieties available
- No fungicides available

Prevalence of Verticillium Stripe in ND

2022 Verticillium Stripe Survey

Verticillium Stripe Prevalence

County	Total Surveyed	Fields Positive (Incidence)
Cavalier	31	5 (25%)
Rollette	7	2 (20%)
Towner	10	2 (5%)
Pembina	13	4 (25%)
Ramsey	7	2 (5%)
Nelson	8	1 (5%)
Walsh	8	1 (5%)
Bottineau	5	1 (5%)
GrandForks	8	0
Benson	1	1 (5%)
Pierce	4	2 (5%)
Total	**102**	**21 (20.6%)**

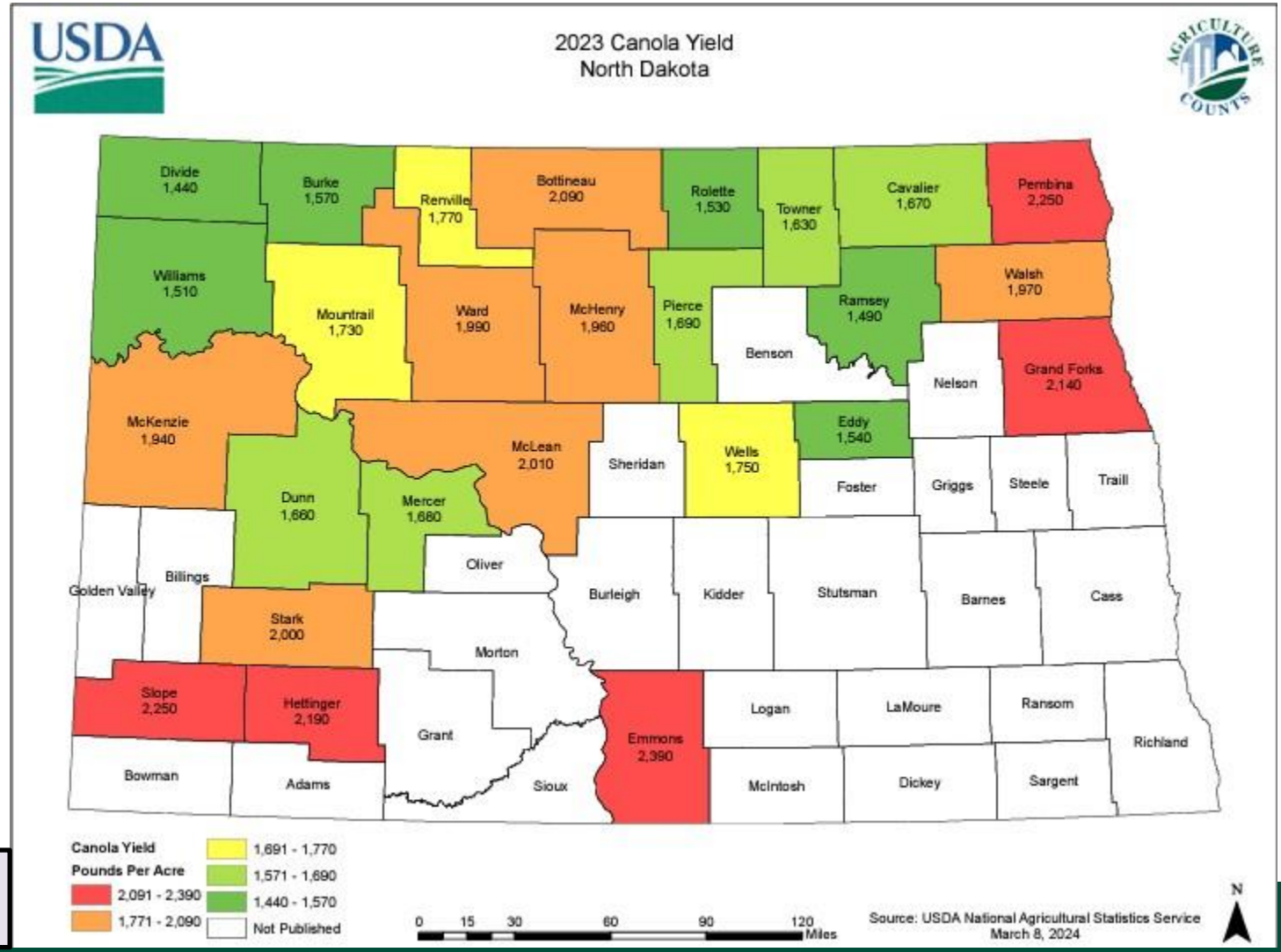
20.6% of the fields were infected with V. stripe

2023 Verticillium Stripe Survey

County	% Incidence
Bottineau	2
Cavalier	3
Grand Forks	0.4
McLean	2
Nelson	2
Pembina	5
Ramsey	0
Renville	3
Rolette	4
Towner	4
Walsh	1
Ward	2

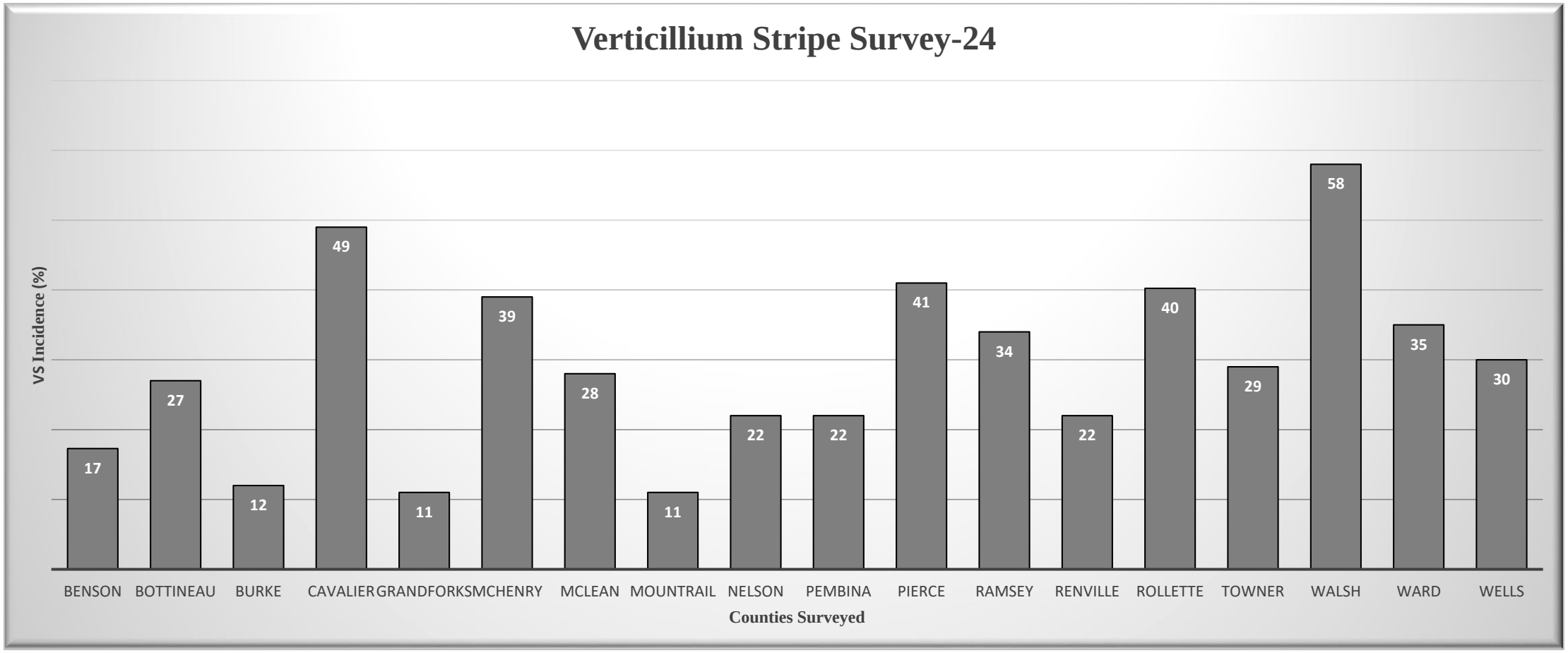
Canola Acreage and the Average Yields in lbs/a

#	County	Acreage
1	Benson	No Data
2	**Bottineau**	**145,000**
3	Burke	86,800
4	**Cavalier**	**246,500**
5	GrandForks	10,500
6	McHenry	61,900
7	**McLean**	**111,000**
8	**Mountrail**	**129,000**
9	Nelson	No Data
10	Pembina	42,000
11	Pierce	34,500
12	Ramsey	81,700
13	Renville	87,900
14	Rollette	62,200
15	Towner	74,100
16	Walsh	46,500
17	**Ward**	**158,000**
18	Wells	6,200

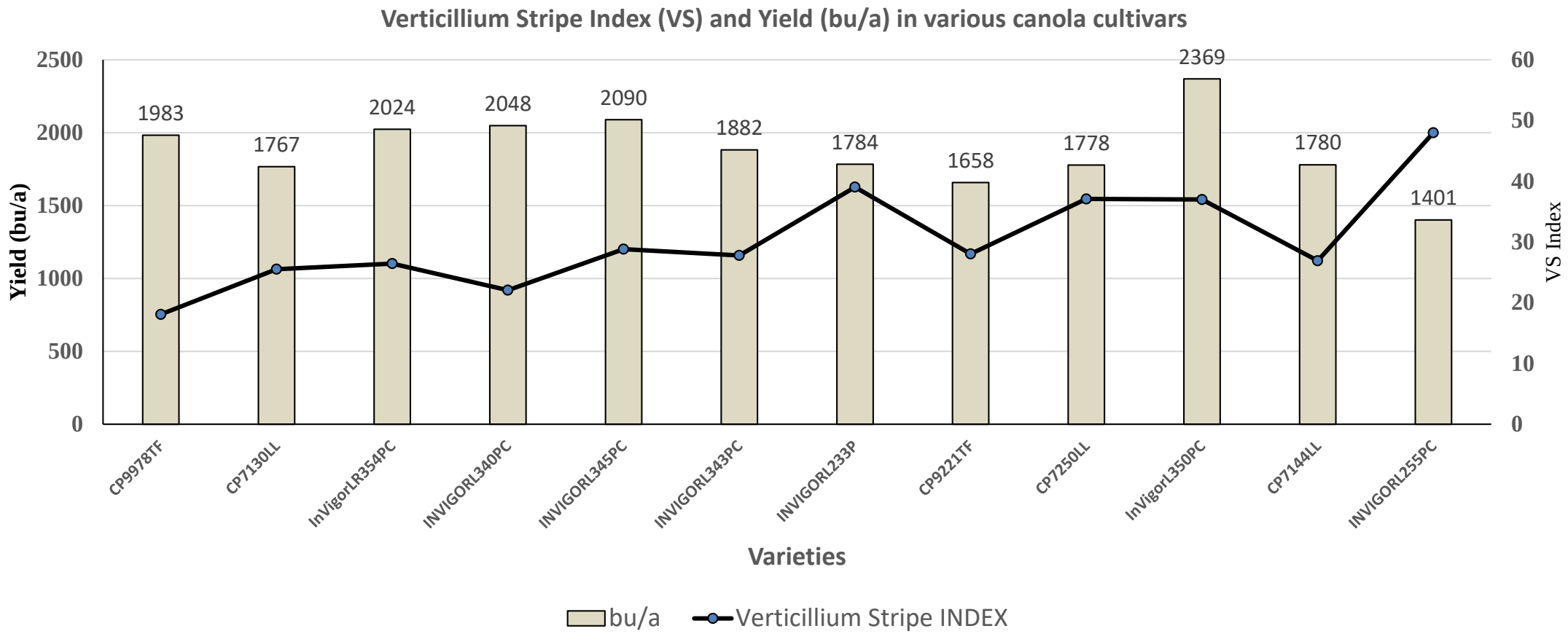


26 Counties

Verticillium Stripe Survey-2024



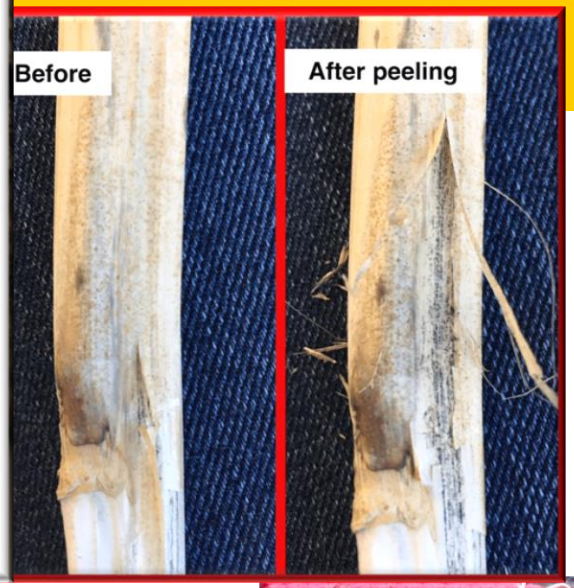
Varietal Resistance to Verticillium Stripe in Canola-2024



Verticillium Seed treatment Trial-2023

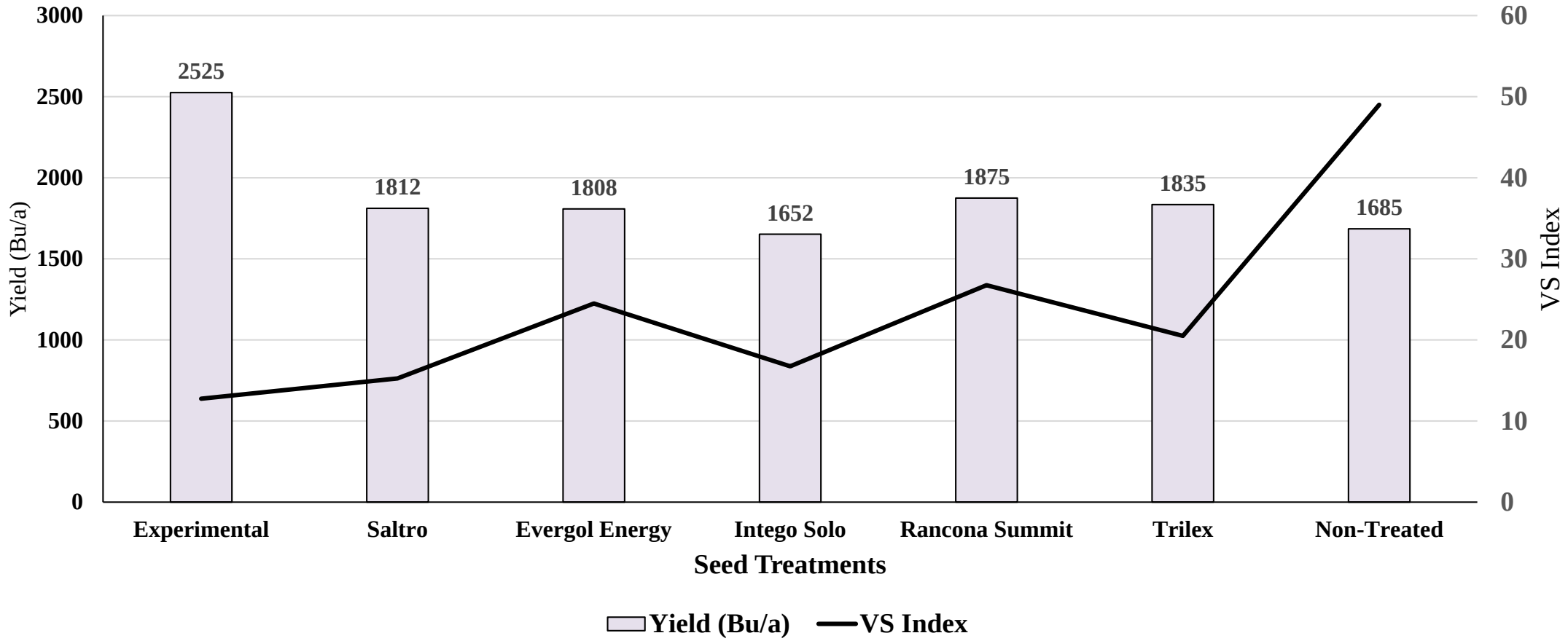
Symptoms

1.Half stem yellowing/senescence
2. Shredding of the stem tissue
3. Greyish hue at the base of the stem on cross section
4. Microsclerotia underneath the epidermis when its peeled



	Plant Stand	Verticillium Stripe		Yield	Test Weight
Treatment	3ft	% Incidence	% Severity	lbs/a	lbs/bu
Vercoras	12	60	26	3873	51.7
Saltro	17	58	23	2960	52.4
Prosper Evergol	17	61	25	3058	52.5
Intego Solo	14	71	32	2698	52.6
Rancona Summit	19	65	29	2985	52.6
Trilex	17	65	30	3082	52.4
Non-Treated	19	62	28	2842	52.5
Mean	16	63	28	3071	52.4
CV%	23	17	21	10	0.6
LSD	5.6	16	9	464	0.4
P-Value (0.05)	NS	NS	NS	0.0016*	0.0057*

Seed treatment to Manage Verticillium Stripe in Canola-2024



Take Home Message

- 4-year rotation helps in ND
- Growing multiple canola varieties can spread out the risk and provide some insurance

Thank You!

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