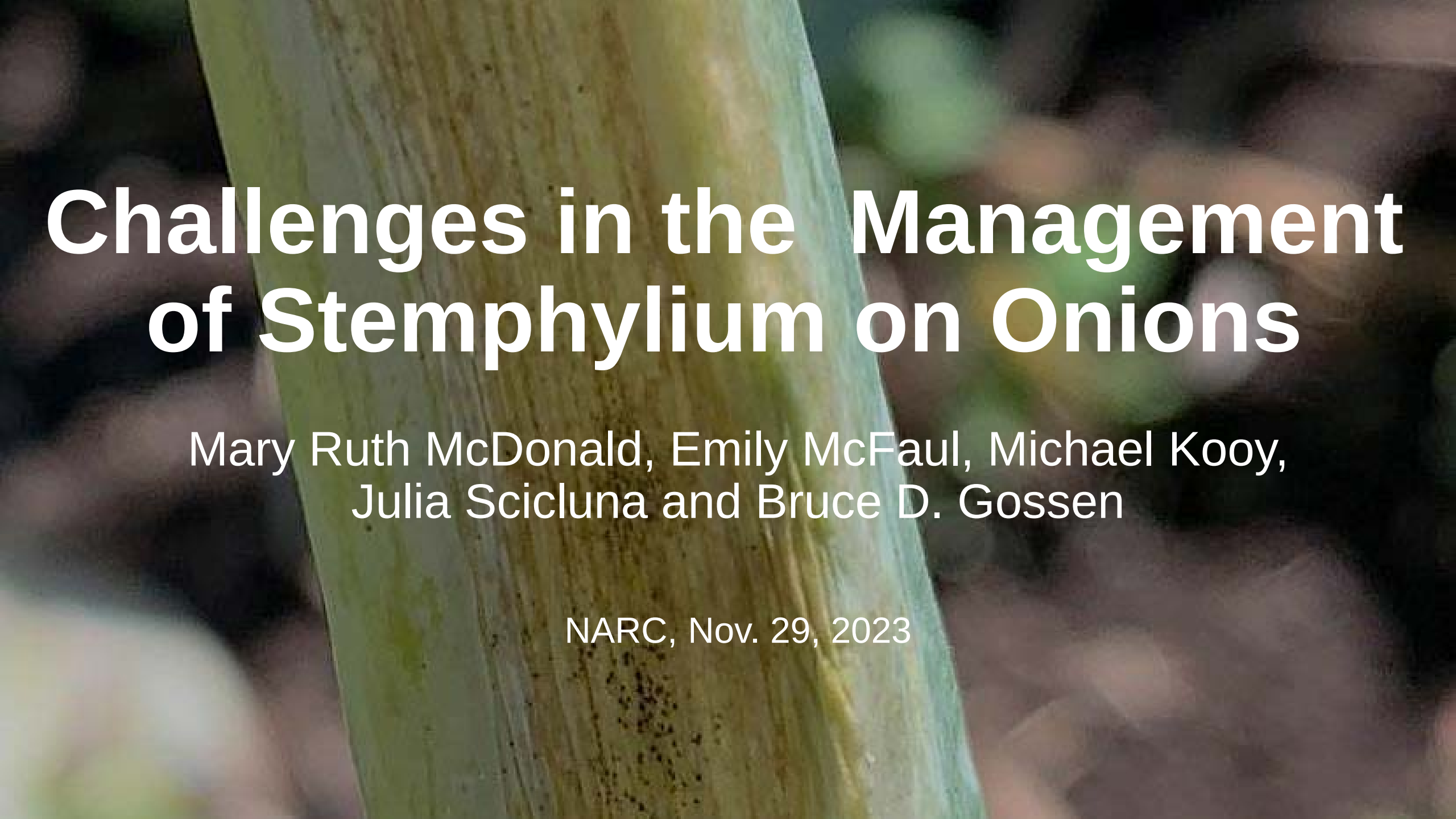


Challenges in the Management of Stemphylium on Onions

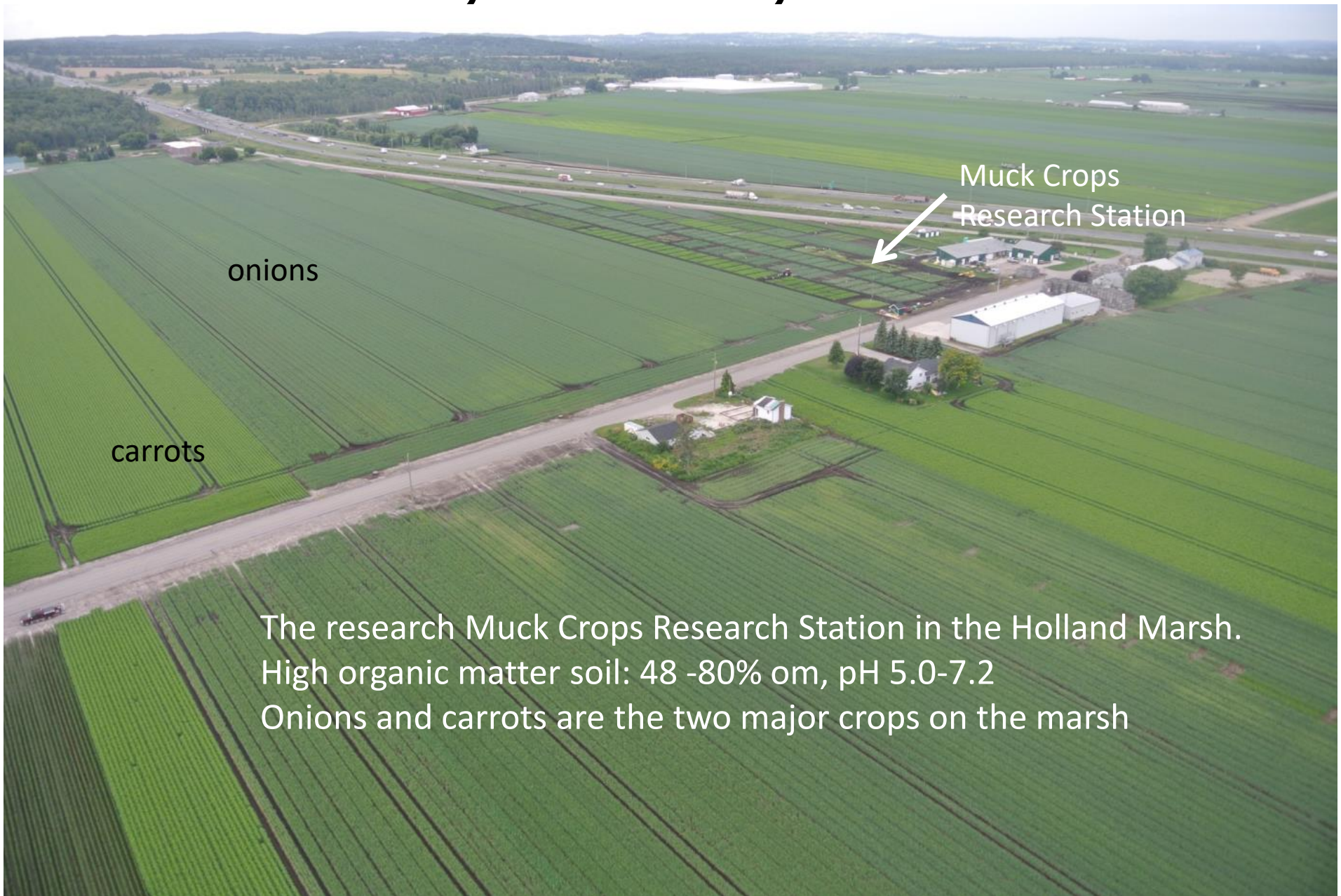
Mary Ruth McDonald, Emily McFaul, Michael Kooy,
Julia Scicluna and Bruce D. Gossen

NARC, Nov. 29, 2023

Holland Marsh , Ontario, Canada 44º 15’ N, 79º 35’W

San Antonio, Texas : 29.4252° N, 98.4946° W

The Holland Marsh, Ontario, Canada



The research Muck Crops Research Station in the Holland Marsh.
High organic matter soil: 48 -80% om, pH 5.0-7.2
Onions and carrots are the two major crops on the marsh

Stemphylium leaf blight on onion

- Reported in Ontario in 2009
- Host: **Onions,** asparagus, leek, pears, many others
- Disease peaks in July-September

Questions:

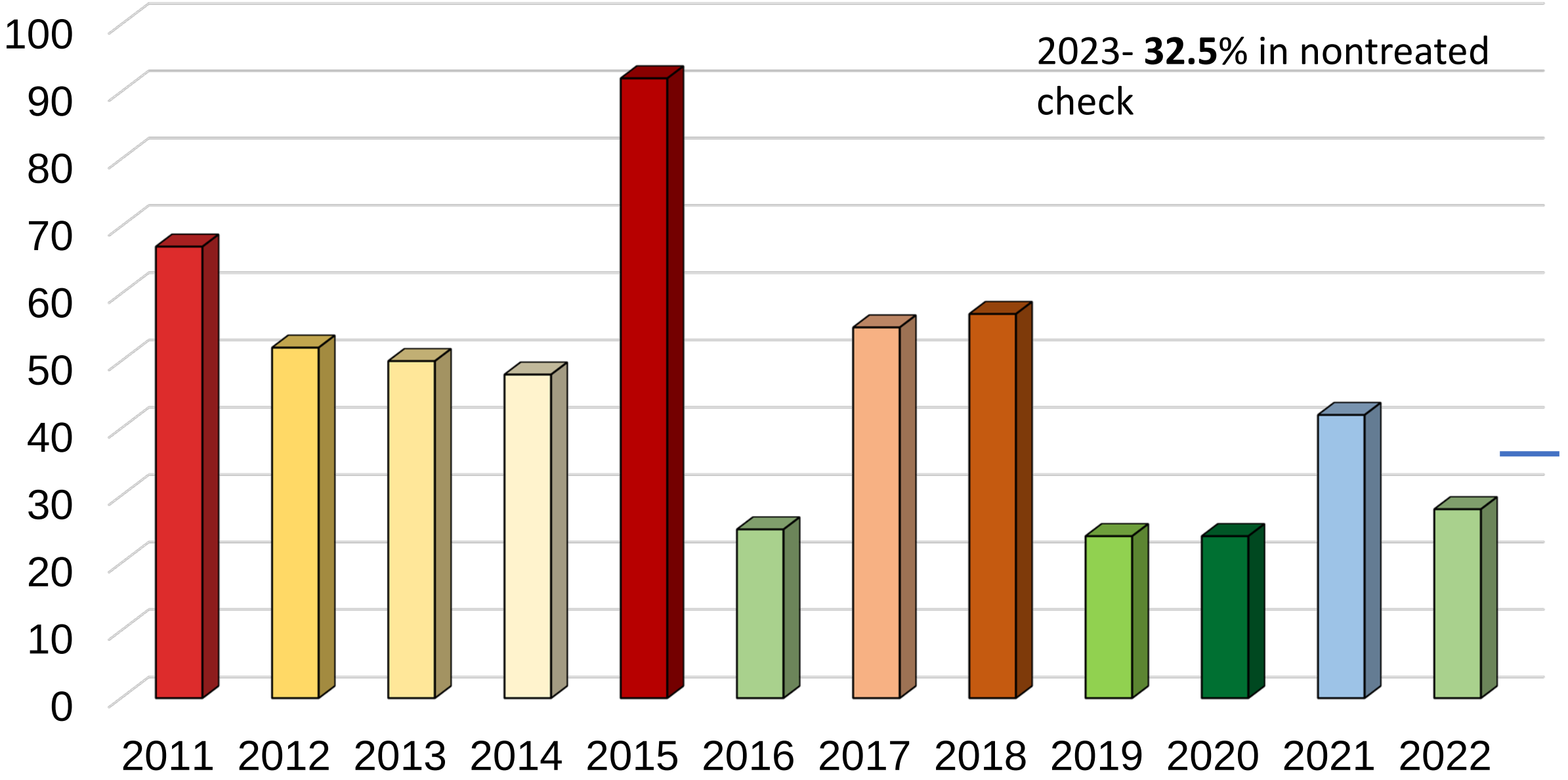
Are there any effective fungicides?

How to effectively forecast disease and time fungicide sprays?

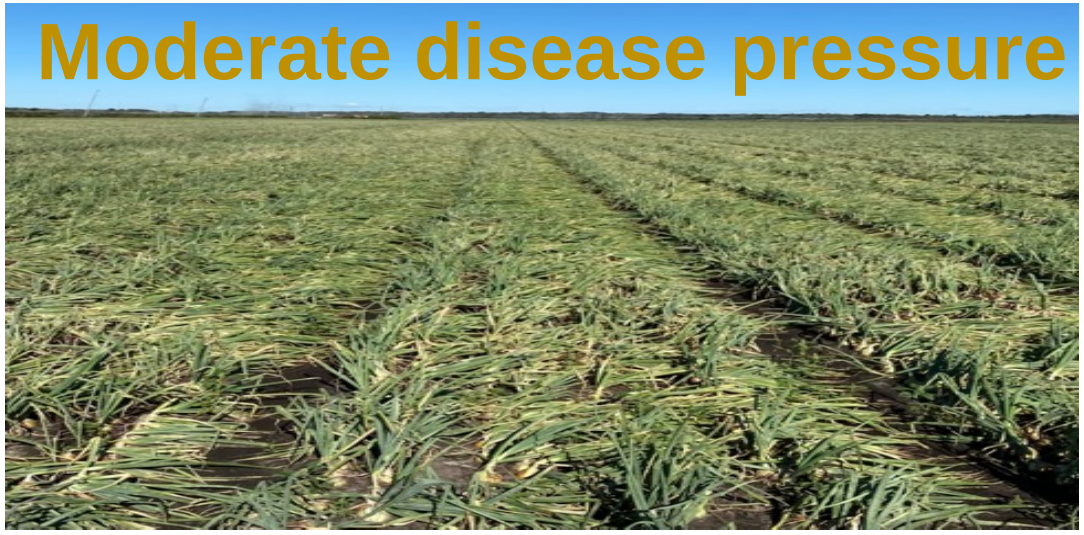
What to do about fungicide resistance?

Why did SLB become a problem?

Disease Severity over time



Disease Development in 2021 and 2022

	Late July	Early September
2021		
2022		

Fungicide Efficicacy

Efficacy of fungicides to control Stemphylium leaf blight since 2011

Treatment	Active Ingredient	Rate/A
Quadris Top	**azoxystrobin + difenoconazole**	13.7 oz
Luna Tranquility	**fluopyram + pyrimethanil**	16.4 oz
Inspire	difenoconzole	7.0 oz
Fontelis	penthiopyrad	19.2 oz
Pristine	pyraclostrobin + boscalid	1.2 lb
Manzate/Dithane	**mancozeb**	2.9 lb
Switch	cyprodinil + fluodioxinil	0.9 lb
Bravo	chlorothalonil	65.7 oz

Additional fungicides assessed in 2020 on

Treatment	Active Ingredient
Allegro	**fluazinam 40%**
Aprovia Top	**benzovindiflupyr + difenoconazole**
Miravis Duo	**pydiflumetofen + difenoconazole**
Merivon	**pyraclostobin + fluxapyroxad**
Sercadis	**fluxapyroxad**
Revysol	mefentrifluconazole
PREV-AM	orange oil 0.4%
Serifel	***Bacillus amyloliquefaciens***
Sunergist	24- epibrassinolide
T-77	*Trichoderma atroviridae*

Assessments

- Weekly Assessments
  - 3 most mature leaves of 20 plants per treatment 0-4 assessment
- Final Assessment
  - Rate all leaves from 0-7 of 20 plants per treatment
  - 0 = no disease, 7 = dead leaves

$$DSI^{*} = \frac{\sum[(class\ no.)(no.leaves\ in\ each\ class)]}{(total\ no.leaves\ assessed \times 4)} \times 100$$

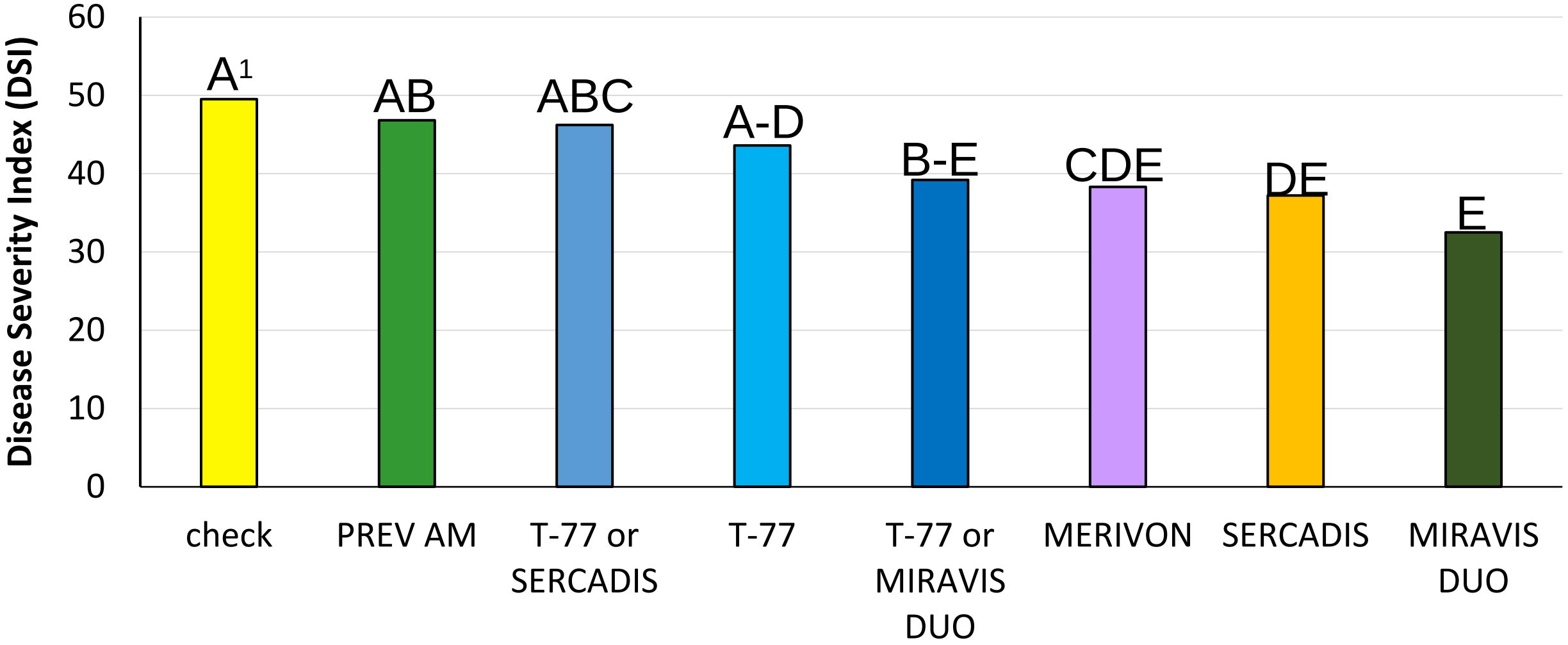
Final Assessment into disease categories

Weekly Assessment for disease

Fungicide trials with no differences in disease severity or yield

Year	Maximum DSI in check	Yield range (t/ha)
2020	26	73 - 80
2022	49	58 - 62
2023	33	65 - 77

2021 Fungicide Trial



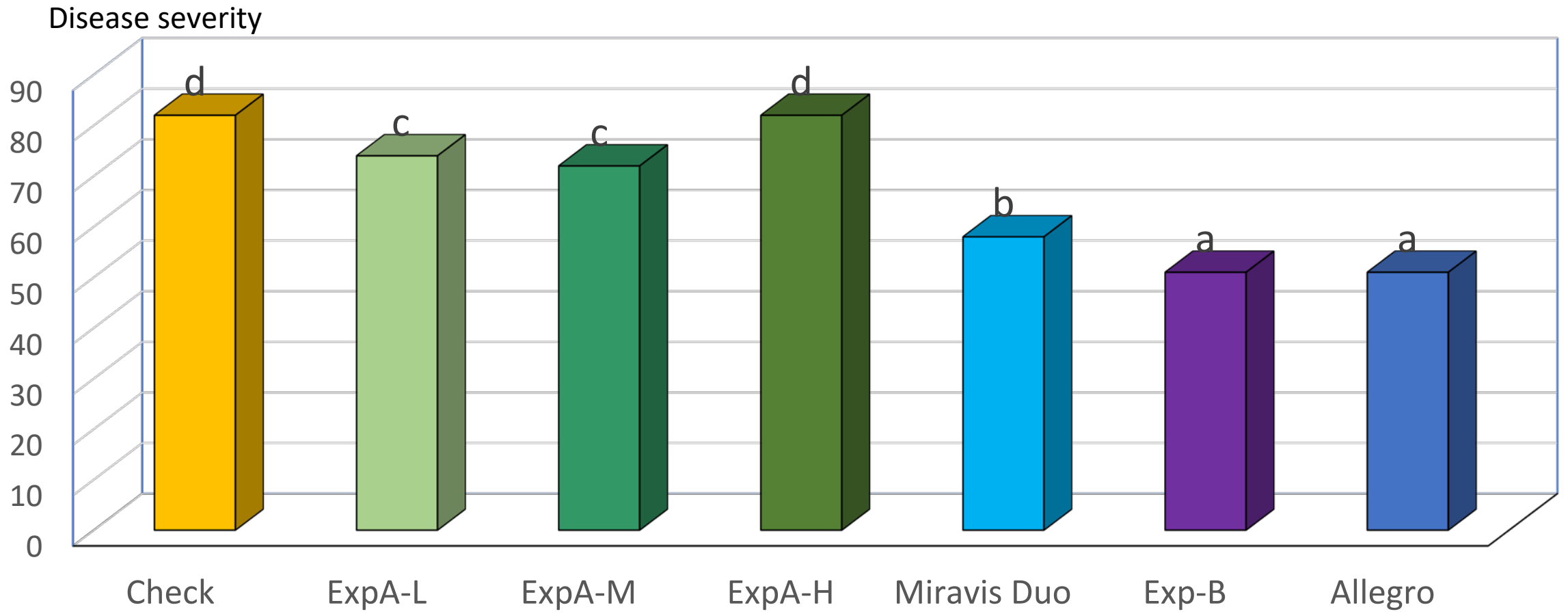
[1] Numbers in a column followed by the same letter are not significantly different at P = 0.05, Fisher's Protected LSD test

Yield 2021

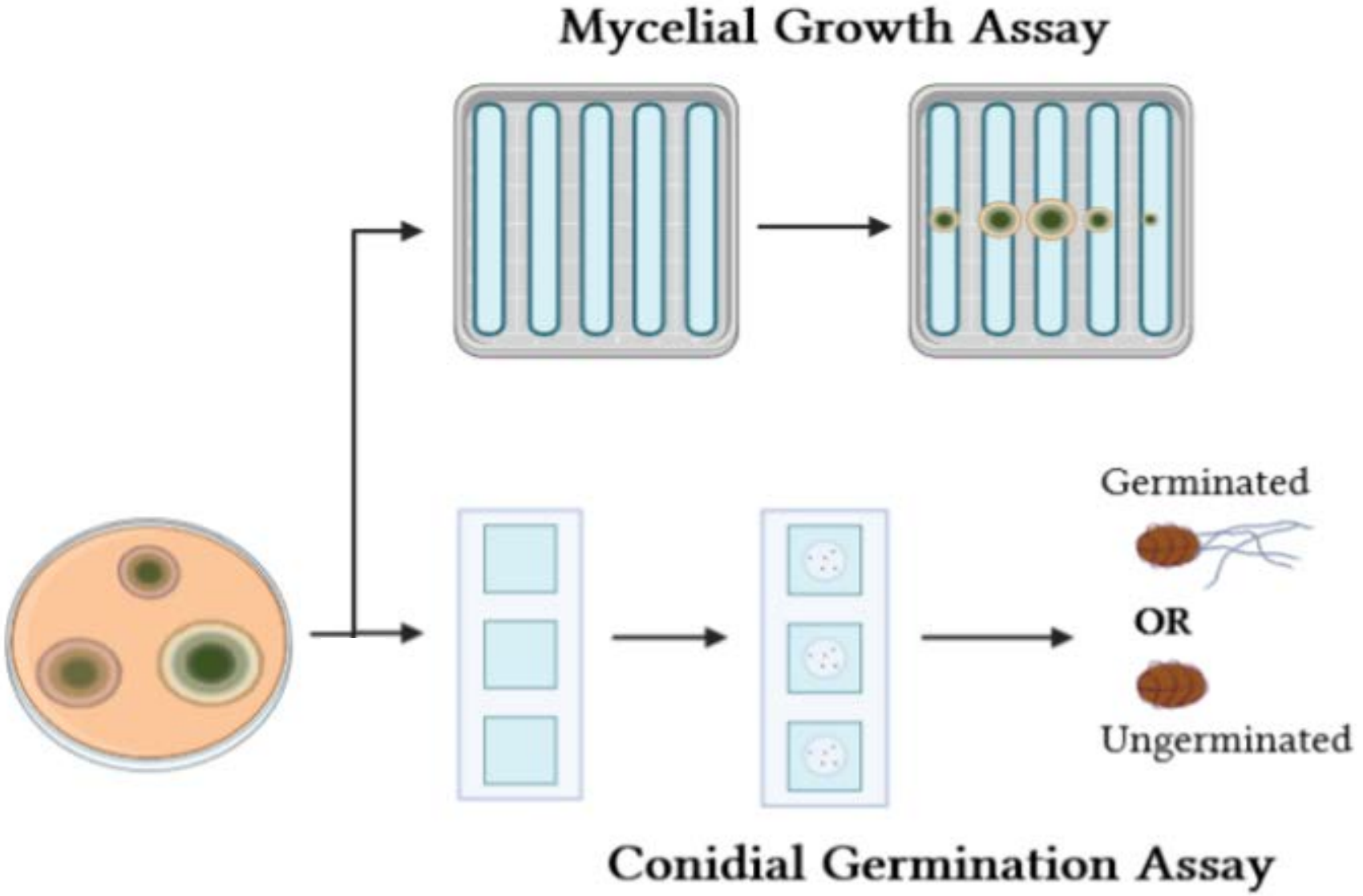
Treatment	Yield (t/ha)	% Mkb
MIRAVIS DUO	66 a[1]	98.1 ns[2]
T-77 alt/w MIRAVIS DUO	65 a	98.2
SERCADIS	64 ab	97.3
T-77 alt/w SERCADIS	64 ab	98.3
MERIVON	61 abc	97.5
Check	59 bc	97.3
PREV AM	56 c	97.1
T-77	55 c	97.1

Fungicides for Stemphylium leaf blight 2023

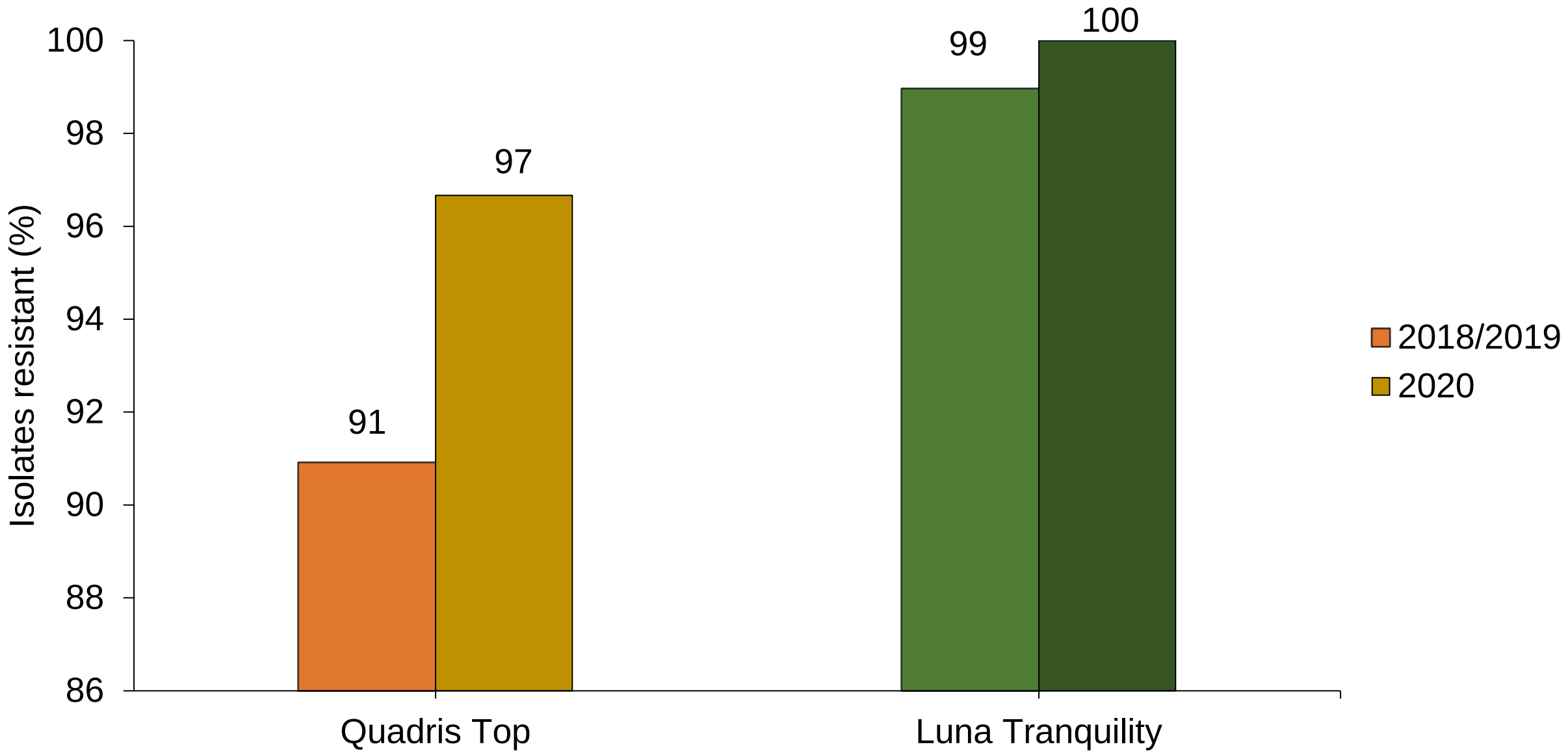
Final assessment



Fungicide resistance



Spore resistance 2018/2019 and 2020



Current Management

- Fungicide application beginning at 3-4 leaf stage (late June)
- Continuation of fungicide application until early August

Product	Active Ingredient	FRAC (group)
Quadris Top	azoxystrobin + [illegible]oconazole	11/3
Luna Tranquility	fluopyram + [illegible]anil	7/9
Sercadis	fluxapyroxad	7
Aprovia	benzovindiflipyr	7
Miravis Duo	pydiflumetofen + difenoconazole	7/3
Merivon	fluxapyroxad + pyraclostrobin	7/11
Revysol	Cevya (mefentrifluconazole)	3
Allegro (2024)	fluazinam	29

Summary of resistance

- High resistance to Quadris Top (azoxystrobin) and Luna Tranquility (fluopyram)
- Moderate resistance to Evergol Prime (penflufen)
- Still relatively low resistance to Merivon (fluxapyroxad) when the mycelium is assessed.
- Assessment of resistance is continuing with 2023 isolates

Fungicides

- Fungicides are not highly effective- some not effective at all
- Reduced control in the field is likely related to fungicide resistance seen in lab
- Recommend to incorporate low risk fungicides such as Allegro into spray program. Evaluation of biological controls will continue
- The IPM program can indicate when disease risk is low, but still needs improvement.

SLB Disease Forecasting

Field Trial 2018 vs. Field Trial 2019

- 8 treatments
  - **Unsprayed**
  - **Weekly (2 leaf start)**
  - **Azoxystrobin seed trt (2 leaf start)**
  - **Penflufen seed trt (2 leaf start)**
  - **BSPcast (start at emergence)**
  - **TOMcast (15 DSVs)**
  - Weekly (4 leaf start)
  - Civitas drench at emergence (2 leaf start)

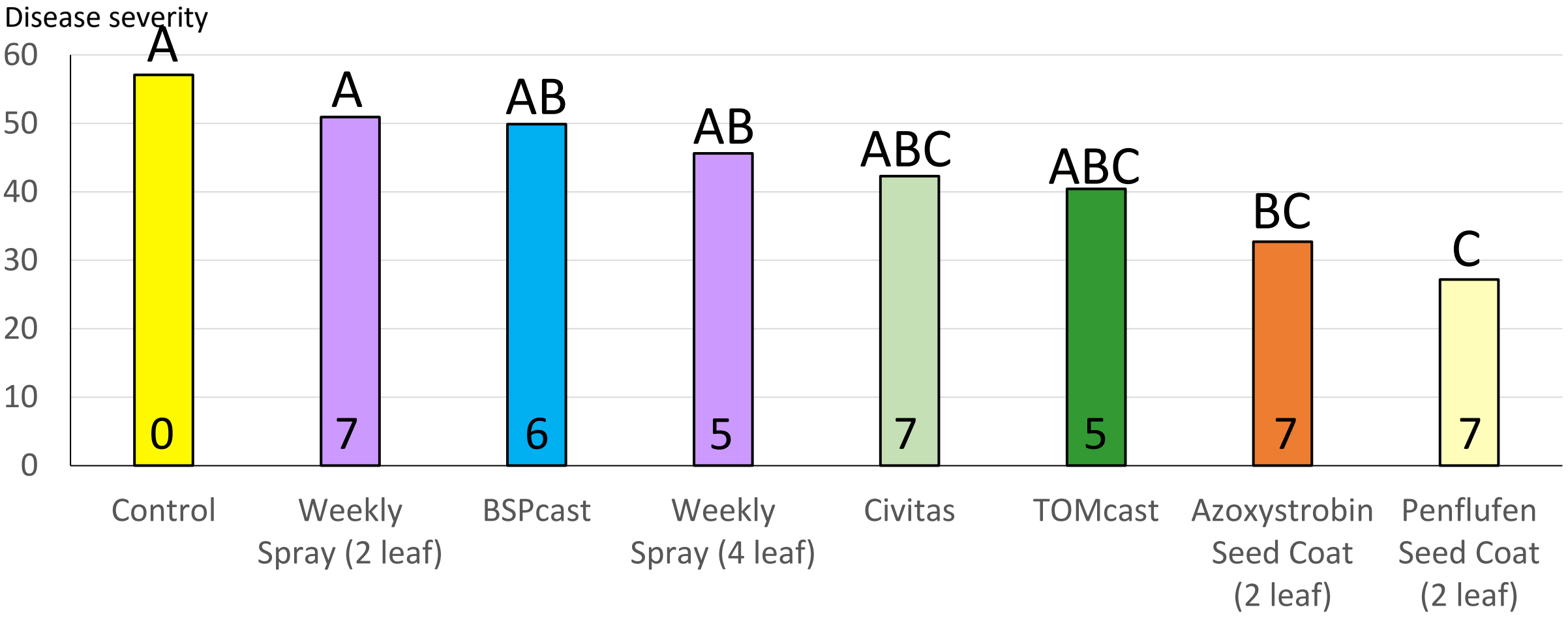
- 8 treatments
  - **Unsprayed**
  - **Weekly (2 leaf start)**
  - **Azoxystrobin seed trt (2 leaf start)**
  - **Penflufen seed trt (2 leaf start)**
  - **BSPcast (start at emergence)**
  - **TOMcast (15 DSVs)**
  - **Azoxystrobin seed trt (no spray)**
  - **Penflufen seed coat (no spray)**

COMPARISON OF SPRAY TIMING PROGRAMS FOR MANAGEMENT OF STEMPHYLIUM LEAF BLIGHT OF ONION

Criteria for calculating DSVs used in TOMCAST (Madden et al., 1978)

	Mean Temperature				
	13 -17 ˚C	18 – 20 ˚C	21 – 25 ˚C	26 – 29 ˚C	DSV
Leaf Wetness Duration	0-6	0-3	0-2	0-3	0
	7-15	4-8	3-5	4-8	1
	16-20	9-15	6-12	9-15	2
	21+	16-22	13-20	16-22	3
	-	23+	21+	23+	4

Disease forecasting 2018



Letters indicate differences based on Tukey's Test ($p<0.05$)

Sprayed with Luna Tranquility alternated with Quadris Top

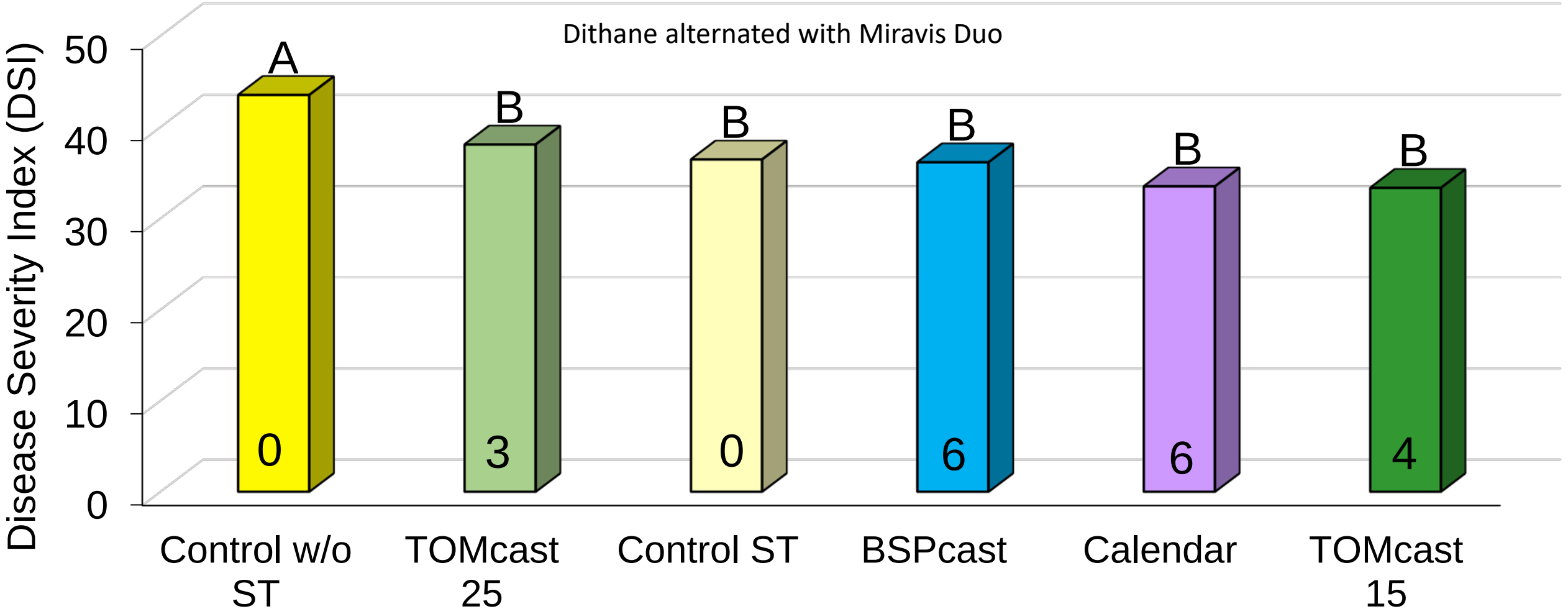
Previous Forecasting Models

Higher disease severity in 2018 than 2019
No differences in yield either year
Penflufen useful as a seed treatment
Forecasting models trigger too many sprays, especially in years with low disease risk

- TOMcast recommended 6 sprays in 2019
- BSPcast recommended 5 sprays in 2019

Need for improved disease forecasting model especially in low disease years

2021 Fungicide Timing Trial



Seed treated with Evergol Prime = penflufen

2021-2022 Research

2021 models still predict too many sprays!

- 6 applications for BSPcast
- 4 applications for TOMcast
- No difference in DSI compared to control

STEMcast model

- Variation of TOMcast model specific for SLB of onions (based literature)

Spore threshold

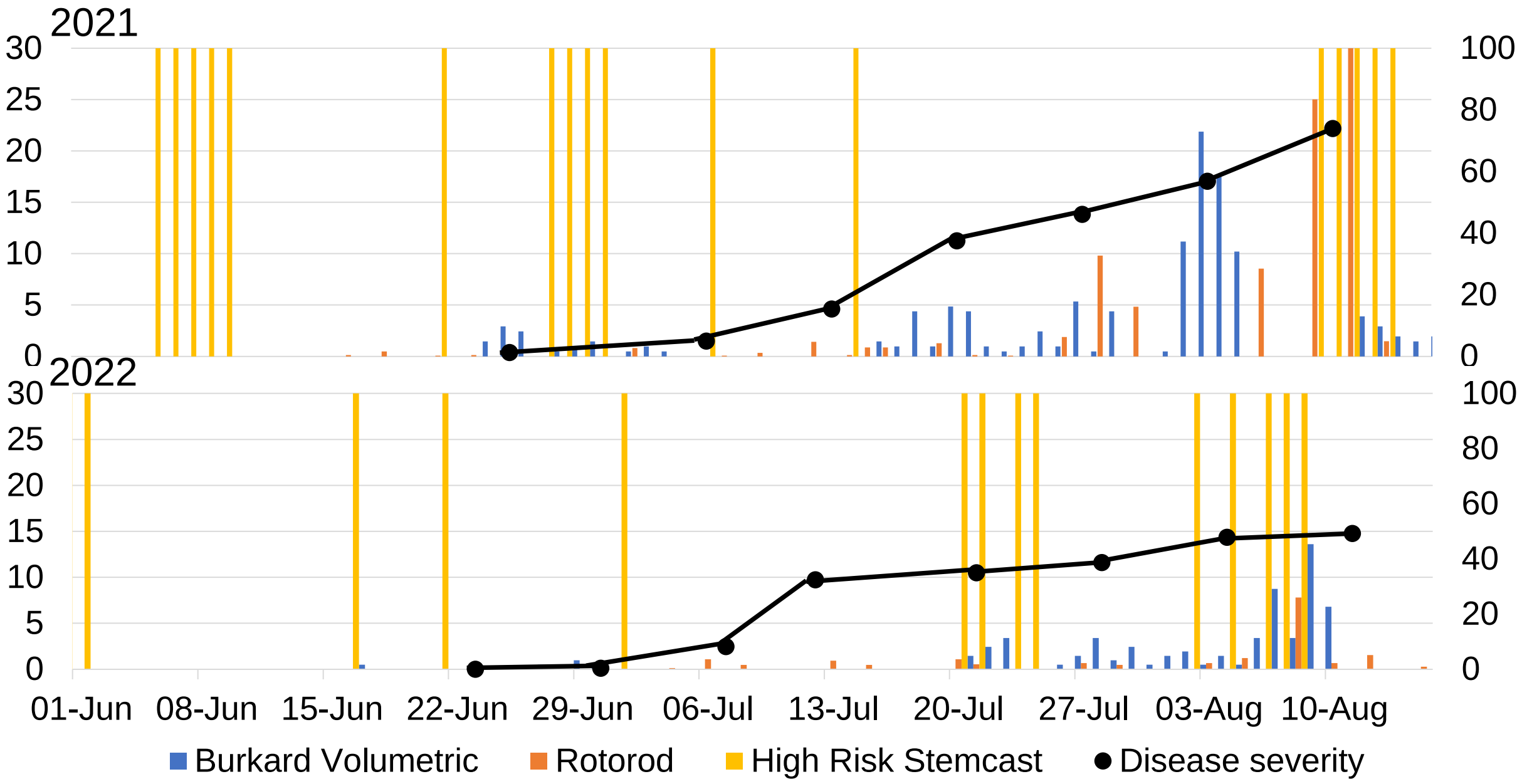
- Can spore trapping help guide spray timing?
- No need to spray if there are no spores

Spore Trapping

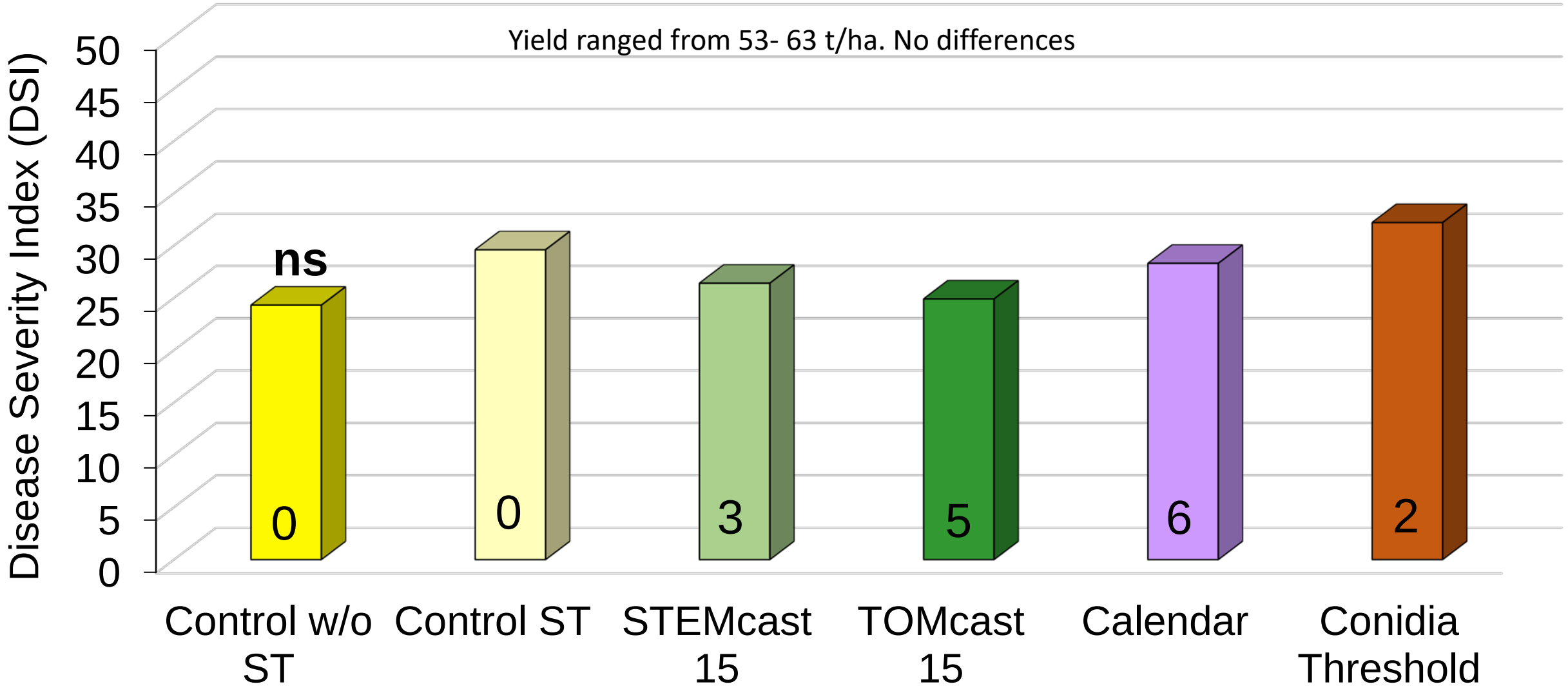
Burkard 7 Day volumetric spore trap

Rotorod spore sampler

Burkard and Rotorod 2021 and 2022



2022 Fungicide Timing Trial



2023- Disease forecasting

Treatment	Sprays	June 29	July 25	Aug 8	AUDPC
Control	**0**	13.3 ns	**51.0 ab**	85.0 ns	**1833 a**
STEMcast 2.0 15/40	**1**	11.9	**51.9 a**	80.9	**1762 ab**
STEMcast 2.0 20C	**3**	10.9	**52.1 a**	82.1	**1760 ab**
TOMcast 15	**5**	12.5	**47.3 abc**	82.3	**1751ab**
Conidia IT	**4**	12.7	**49.7 abc**	82.9	**1742 ab**
STEMcast 2.0 15	**2**	10.5	**50.8 ab**	79.3	**1698 b**
Conidia Threshold 20	**6**	11.6	**46.1 bc**	78.5	**1671 b**
Calendar Spray	**6**	11.8	**45.1 c**	78.4	**1661 b**

Yield range 47-57 tonnes/ha. No differences

Weather vs Spore Trapping?

As DSI increases spore counts increase
-cause or effect?
Unclear if spore trapping indicates disease risk
– will modify further

The updated Stemcast program shows promise

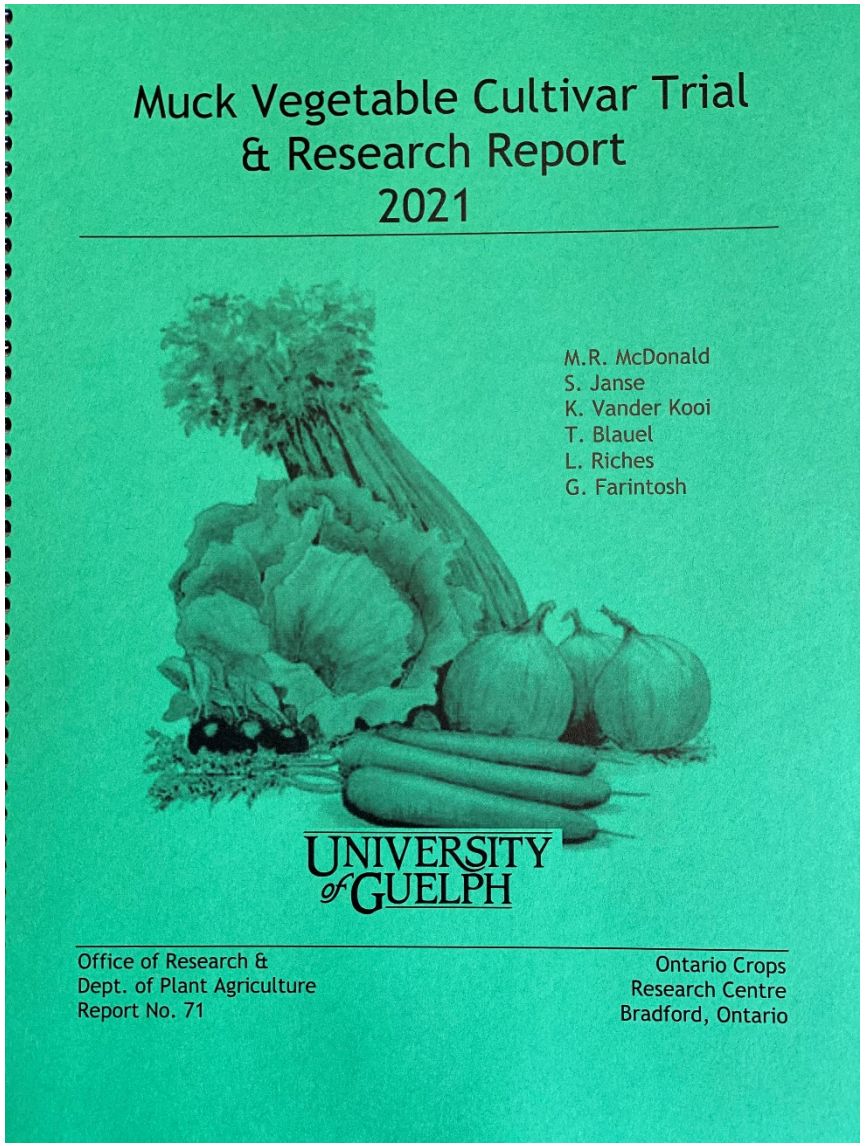
The rotorod trap appears more accurate than the Burkard

Challenges:

- Stemphylium is resistant to most registered fungicides
- Most fungicides registered in Canada include group 7, so there is little opportunity to alternate modes of action.
- Allegro (fluazinam) could be very helpful in managing resistance.
- Need more novel modes of action
- Effective biologicals would be beneficial
- Difficult to determine the best disease forecasting program if there are no effective fungicides.
- However, it is clear that the forecasting is recommending too many sprays.

Summary

- Where does the inoculum over winter? Is this important?
- Is early season infection important?
- How to modify disease forecasting to avoid unneeded sprays?
- Is spore trapping a useful addition to disease forecasting?
- What are the best approaches to resistance management?



All research trials are summarized in the Annual Report

Download at the Research Station web site (new website)

Note new name: Ontario Crops Research Center- Bradford

https://bradford-crops.uoguelph.ca/

Acknowledgements

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Canada

University of Guelph
Ontario Agricultural College
Department of Plant Agriculture

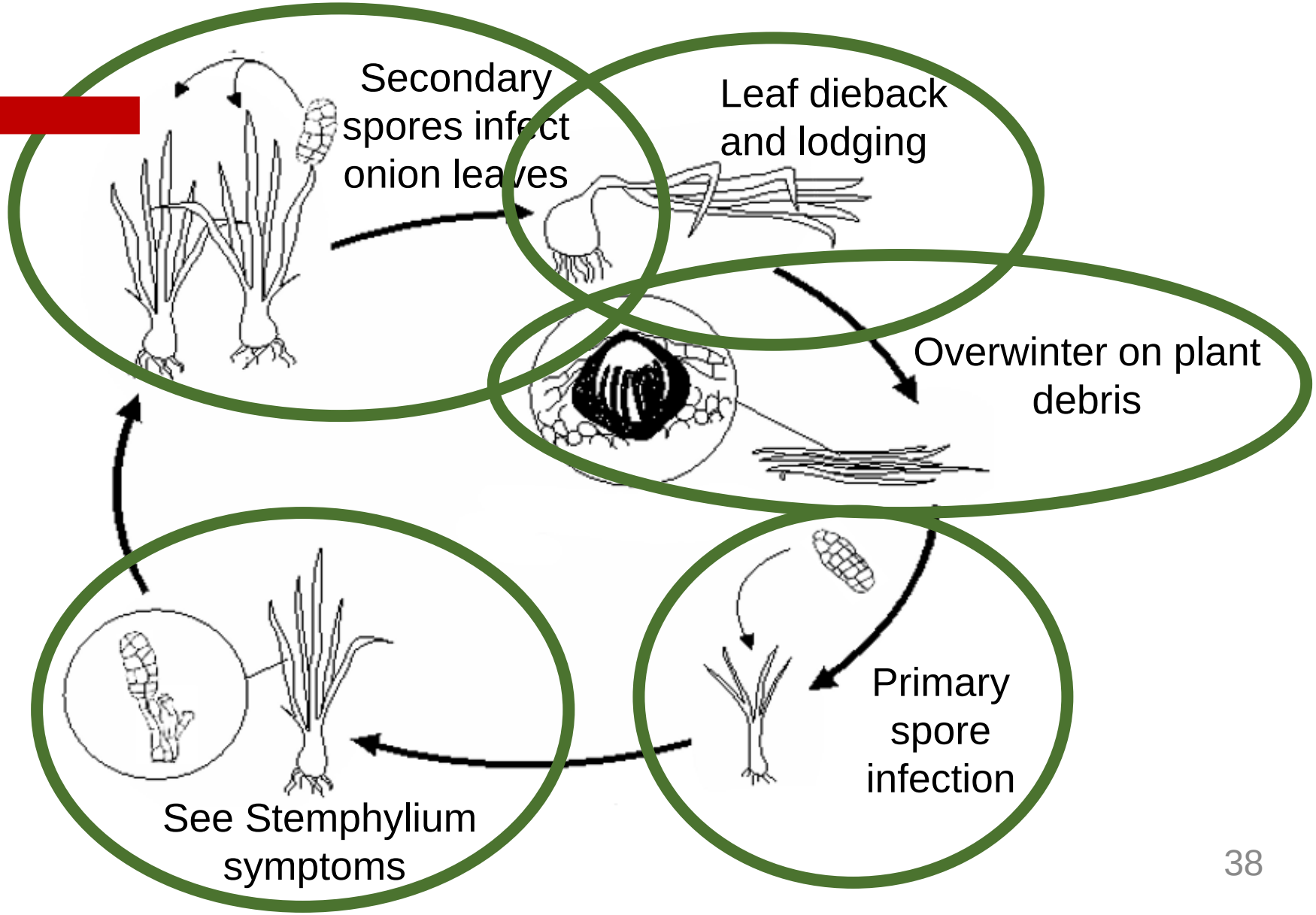
fvgo Fresh Vegetable Growers of Ontario

Agriculture and Agri-Food Canada

Ontario


Thank you

S. vesicarium Lifecycle



S. Stricker, 2021