Cornell Cooperative Extension
Cornell Vegetable Program

Managing Stemphylium Leaf Blight of Onion With Fungicides in New York

Christy Hoepting

Cornell Cooperative Extension

Cornell Vegetable Program

2018 Empire Expo – Onion SLB Fungicide Resistance Workshop, Syracuse, NY: January 17, 2018

Acknowledgements

Grower Cooperators:

- Mark & Max Torrey, Big O
- Guy Smith, Triple G Farms

Research Collaborator:

- Frank Hay, NYSAES

CVP Technicians:

- Amy Celentano
- Audrey Klein

Funding provided by:

- NYFYI
- Federal Capacity Funds
- BASF
- Bayer Crop Protection

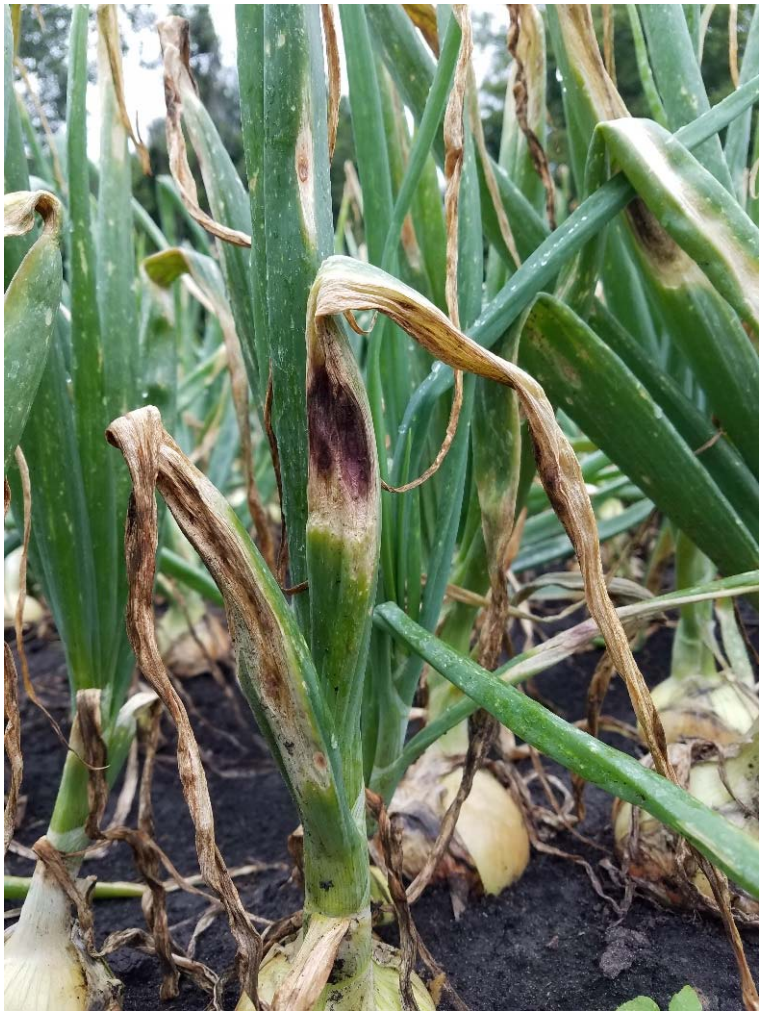
Stemphylium Leaf Blight

- Tan, black and purplish-red target spot lesions on



Photos: C. Hoepting

2017 Moderate & Wet Weather Favorable for SLB



SLB put on a spectacular lesion show of purple & orange

Photos: C. Hoepting

Stemphylium Leaf Blight

- Causes excessive leaf die back

normal

excessive

Photos: C. Hoepting

Stemphylium Leaf Blight

Premature mortality; onions “dying standing up”

Photo: C. Hoepting

Effect of Premature Mortality (Dying Standing Up) on Bulb Rot

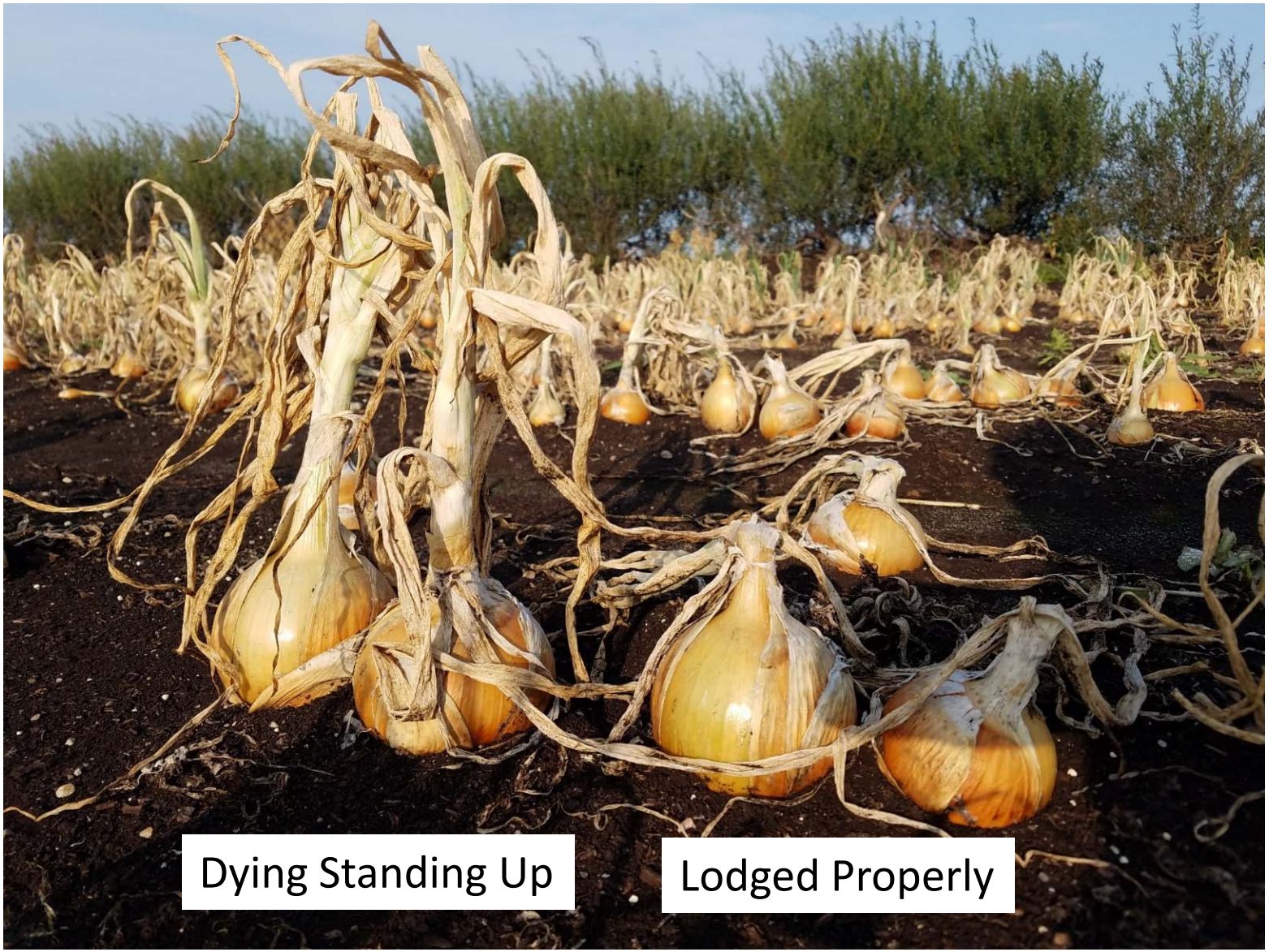
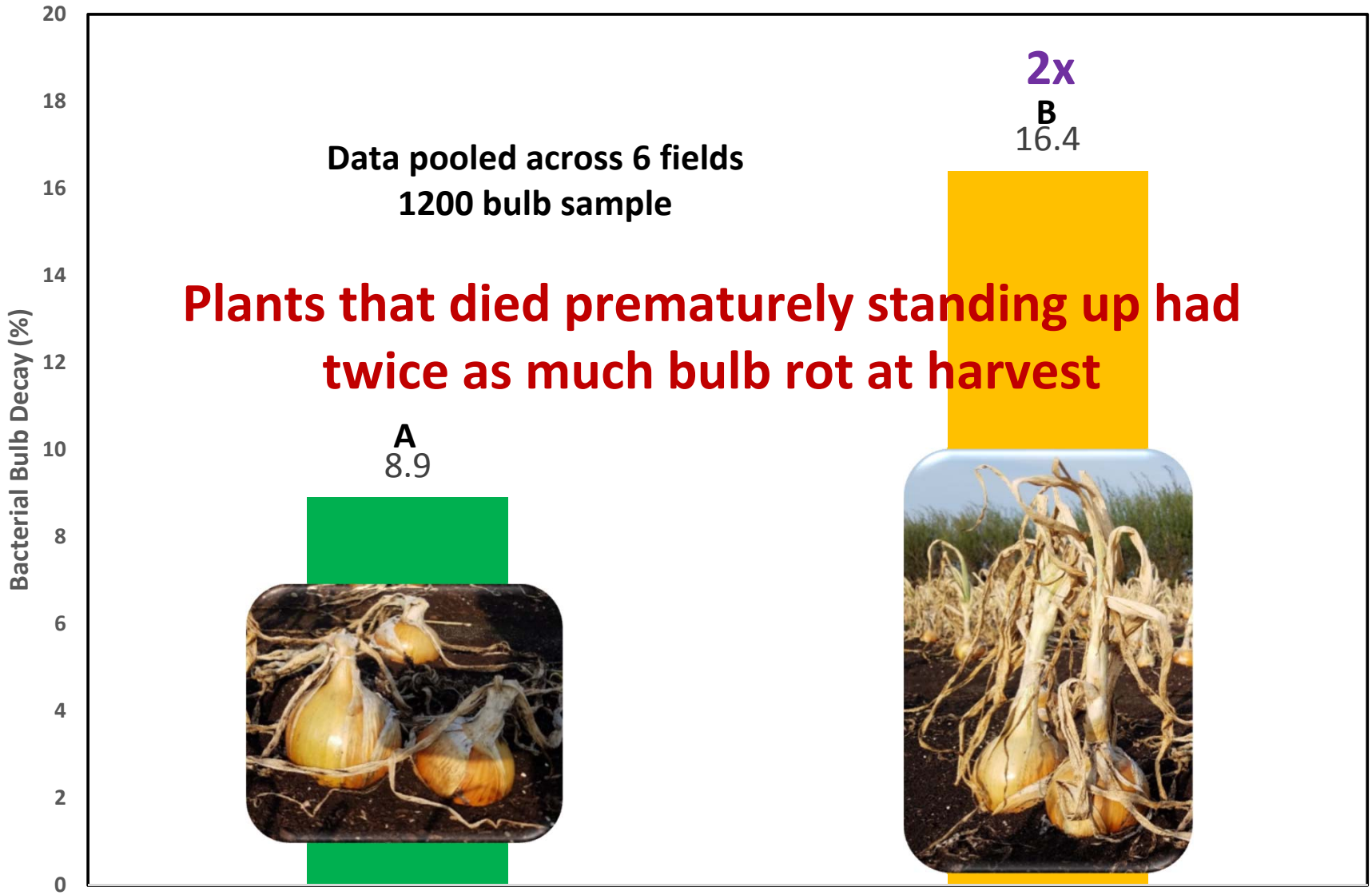


Photo: C. Hoepting

Effect of Premature Mortality (Dying Standing Up) on Bulb Rot



Hoepting 2015

2017 SLB Fungicide Trial Objectives

1. **To monitor active ingredient/FRAC group for field performance.**
   - Compare results with Frank Hay laboratory screening for resistance
   - Note: SLB has developed resistance to FRAC 11 fungicides in New York (e.g. axoystrobin in Quadris, pyraclostrobin in Cabrio, Pristine, Merivon)
   - Single vs. multiple active ingedients
   - Preserve useful longevity of most effective FRAC groups
     - FRAC 7 (Luna Tranquility and Merivon)
     - FRAC 3 (Inspire Super, Quadris Top, etc.)

2017 SLB Fungicide Trial Objectives

2. **To investigate lower rates of most effective SLB fungicides to improve affordability**
   - Luna Tranquility 12 fl oz vs. 16 fl oz ($50 vs. $40/A)
   - Merivon 9 fl oz vs. 5.5 fl oz ($60 vs. $35/A)
   - Inspire Super 20 fl oz vs. 16 fl oz ($35 vs. $30)

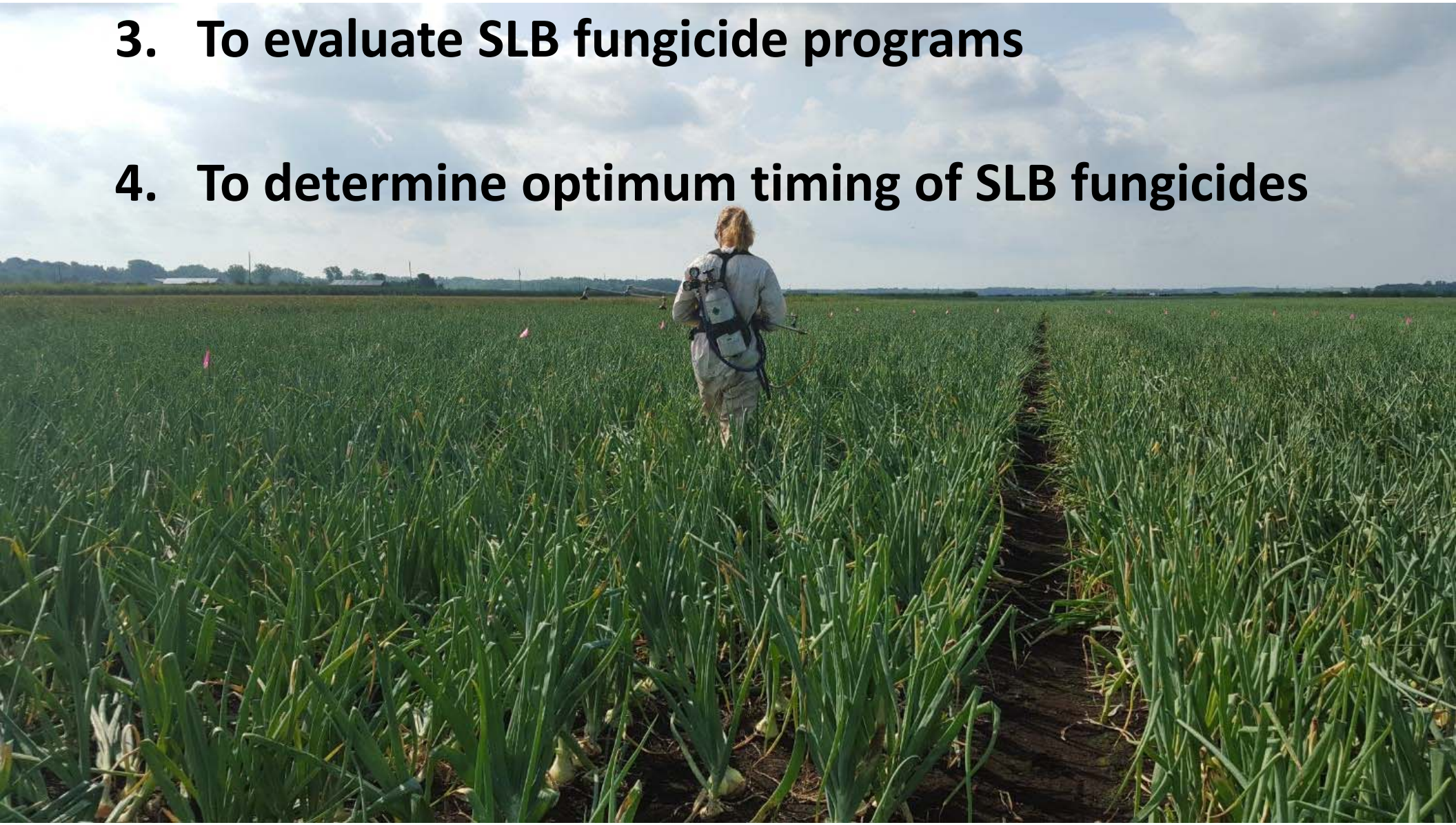
3. **Identify alternatives for FRAC 3 & 7 for SLB for resistance management.**
   - Rovral 1 pt (2) + Scala 9 fl oz (9)
   - Tanos (27, 11) +/- Rovral
   - Gavel (22, M3)
   - Serifel* (44) +/- Rovral/Cabrio

**Bacillus amyloliquefaciens* strain MBI 600

2017 SLB Fungicide Trial Objectives

3. **To evaluate SLB fungicide programs**

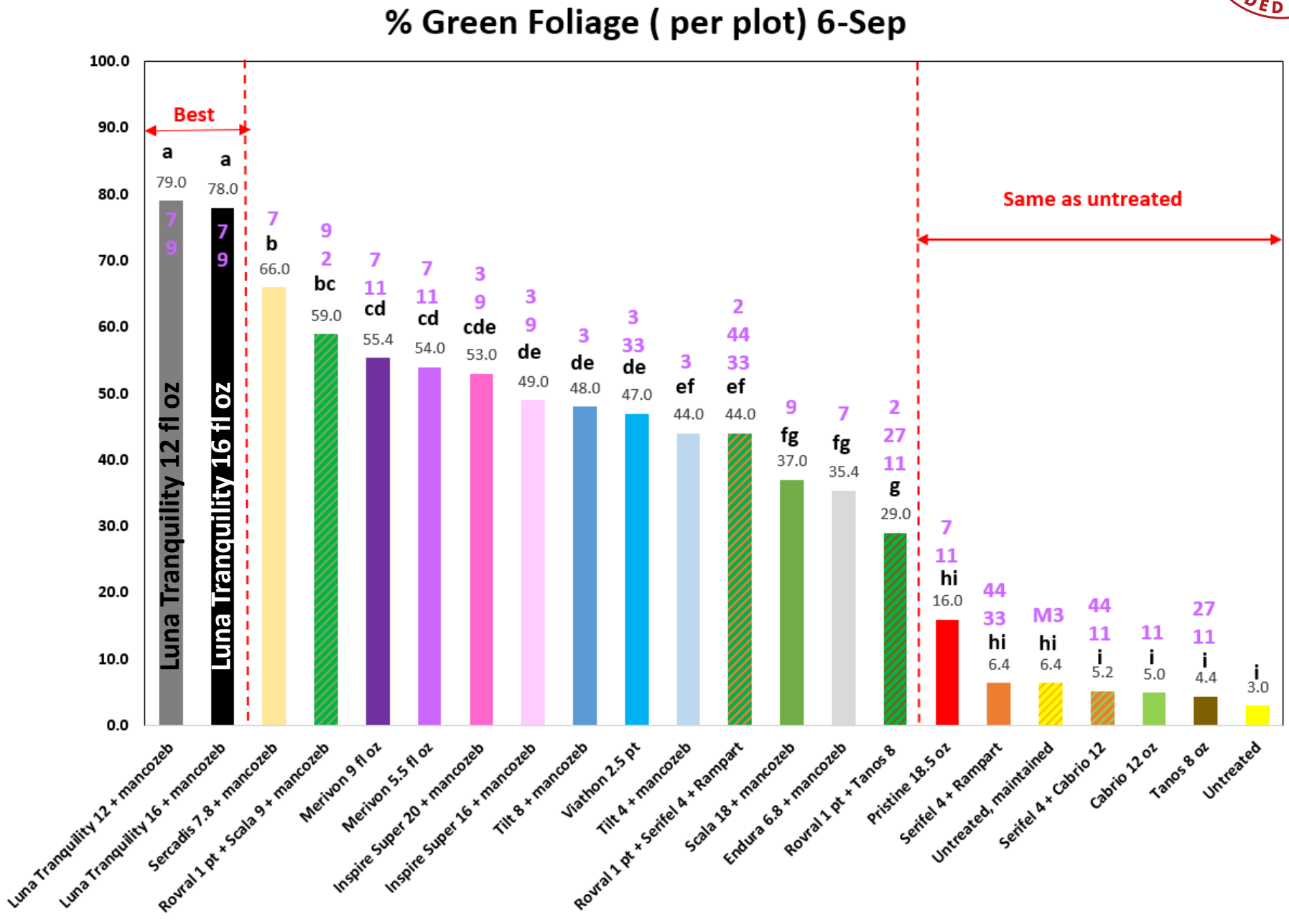
4. **To determine optimum timing of SLB fungicides**



2017 SLB Product Trial, Elba

6 weekly applications:
Jul 15: 8-9 leaf, just start bulb
Aug 20: 2-3” bulb, ~50% lodging
Variety: Gunisen

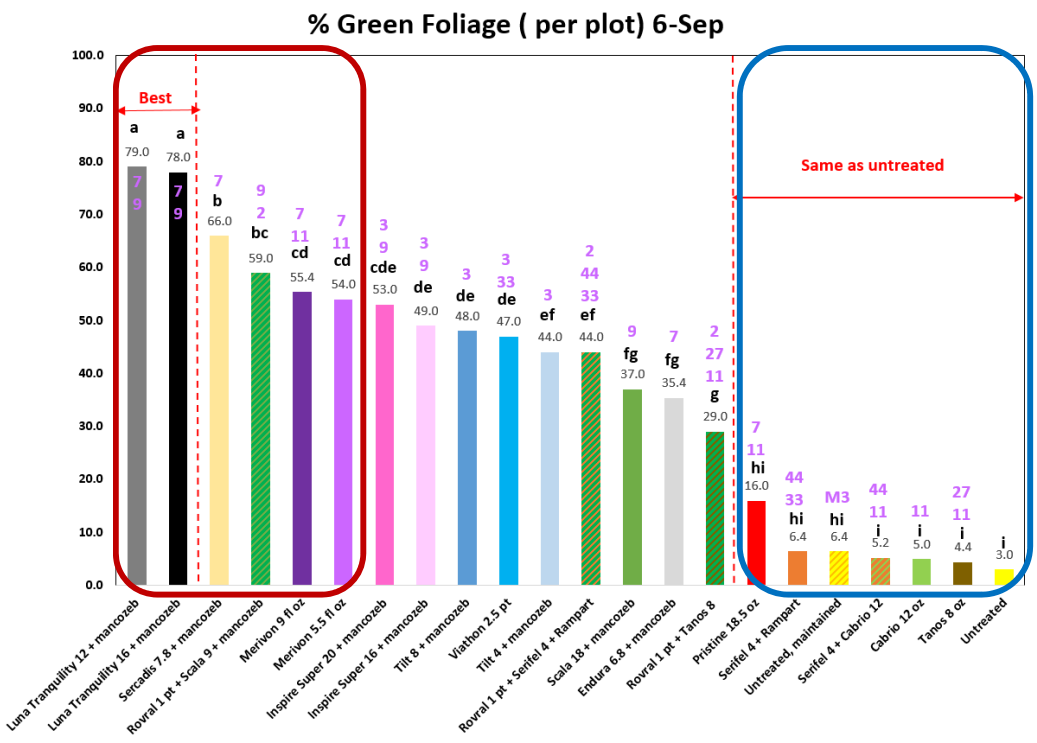
2017 SLB Product Trial

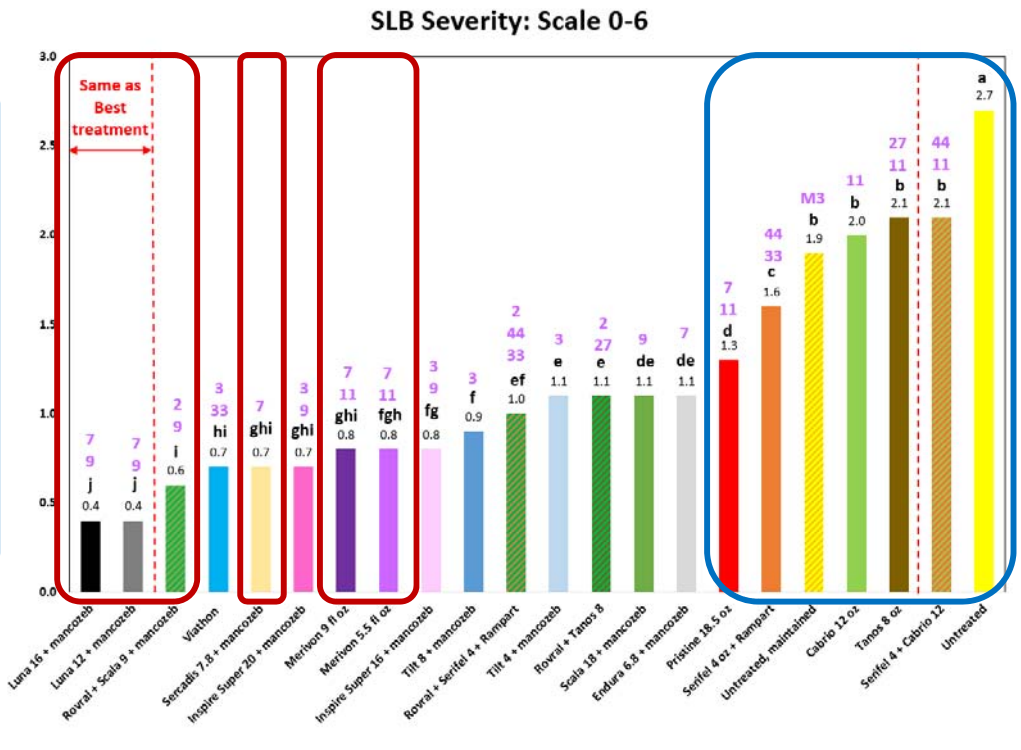


2017 SLB Product Trial

Top 6 best performing treatments

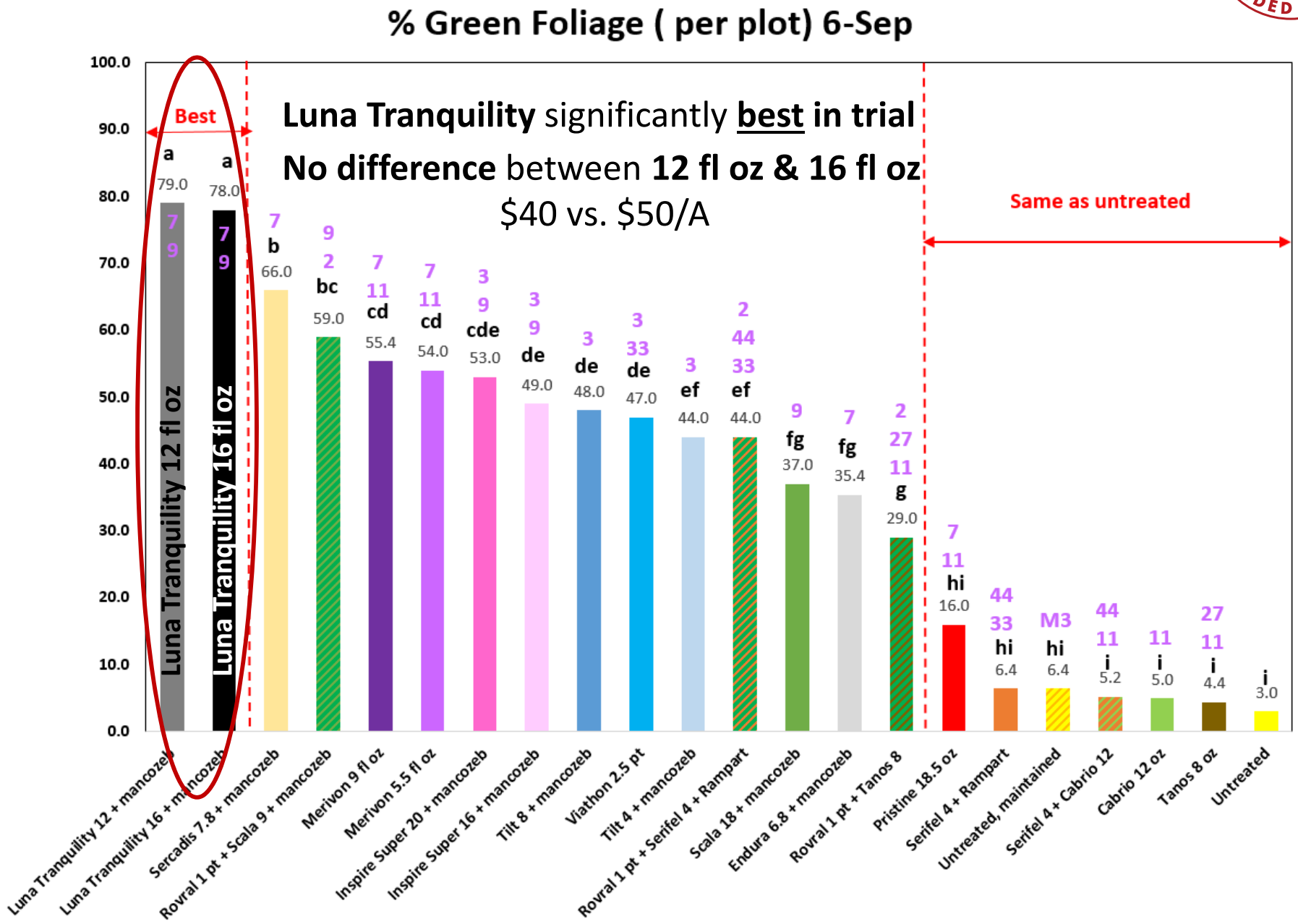
Top 7 worst performing treatments



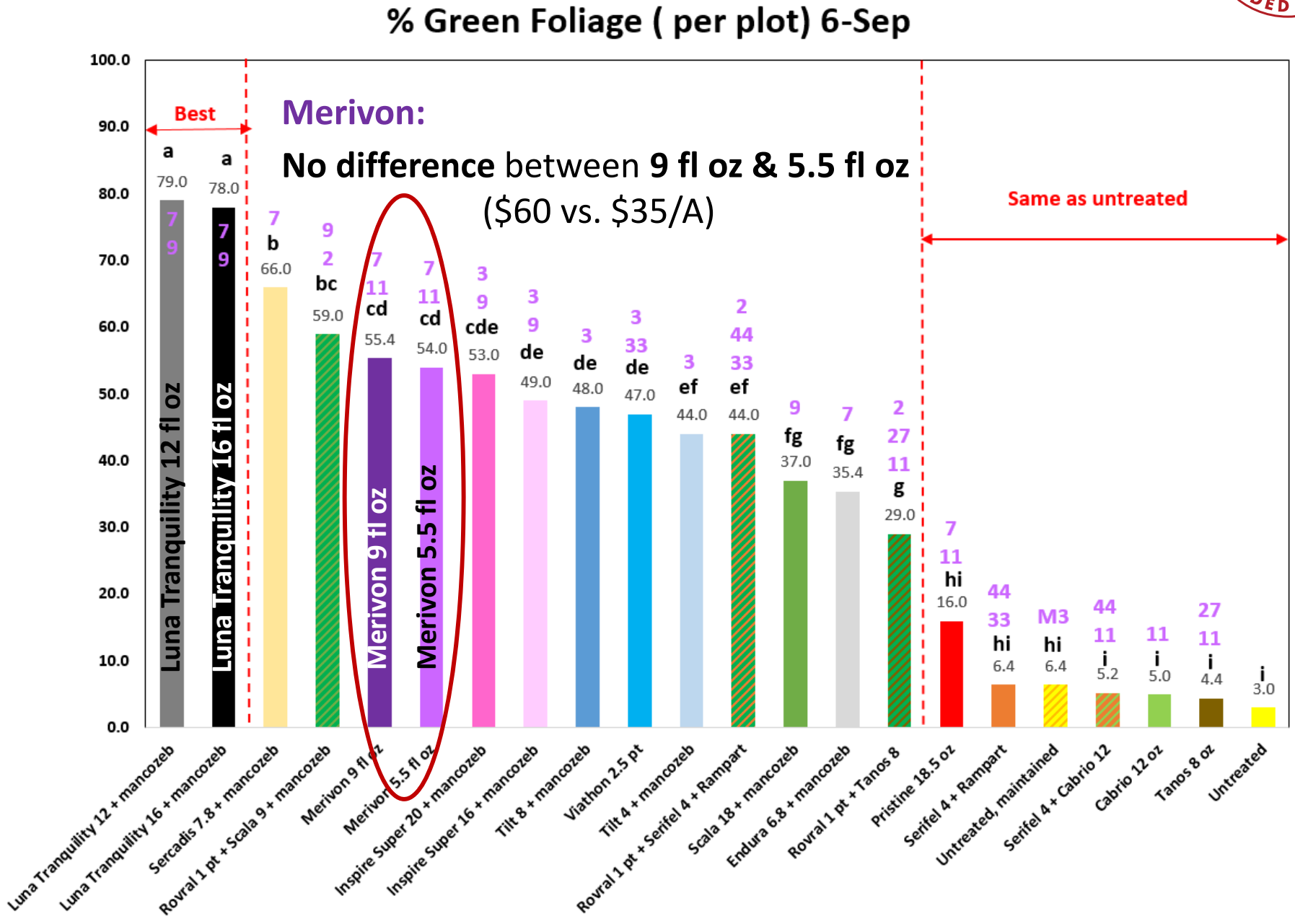


Green foliage was closely related to SLB disease severity

2017 SLB Product Trial



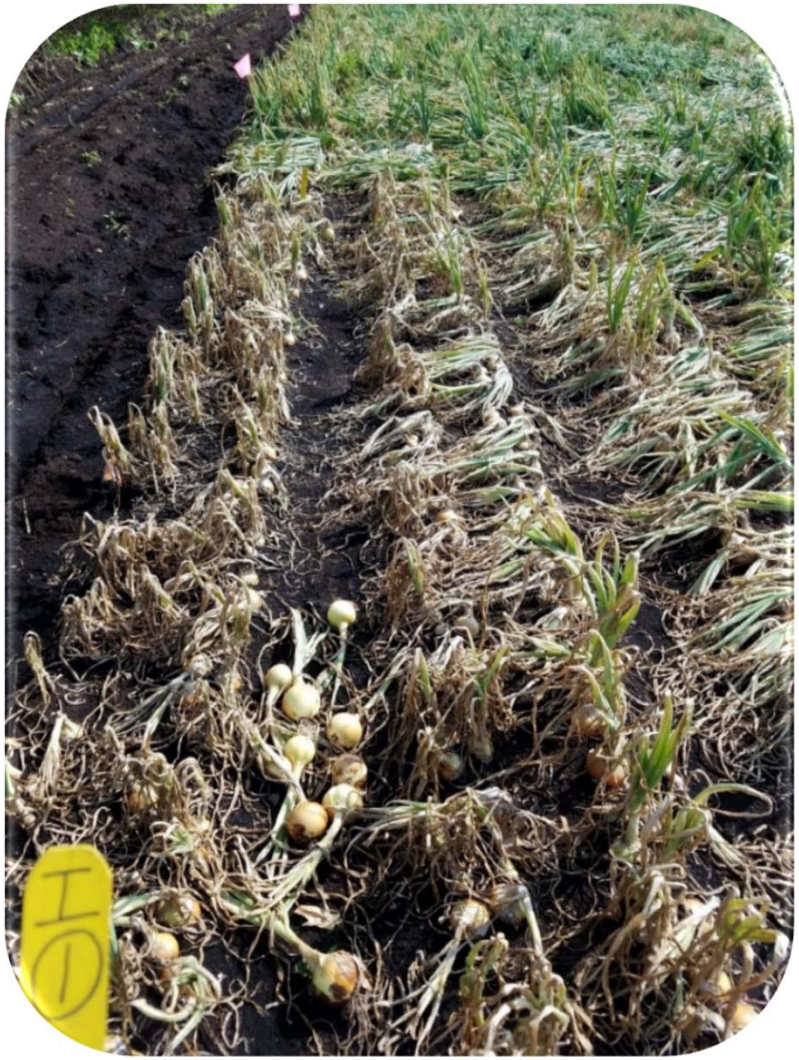
2017 SLB Product Trial



Is it okay to use lower rates for SLB resistance management?

2017 SLB Product Trial

AUG 25, 2017



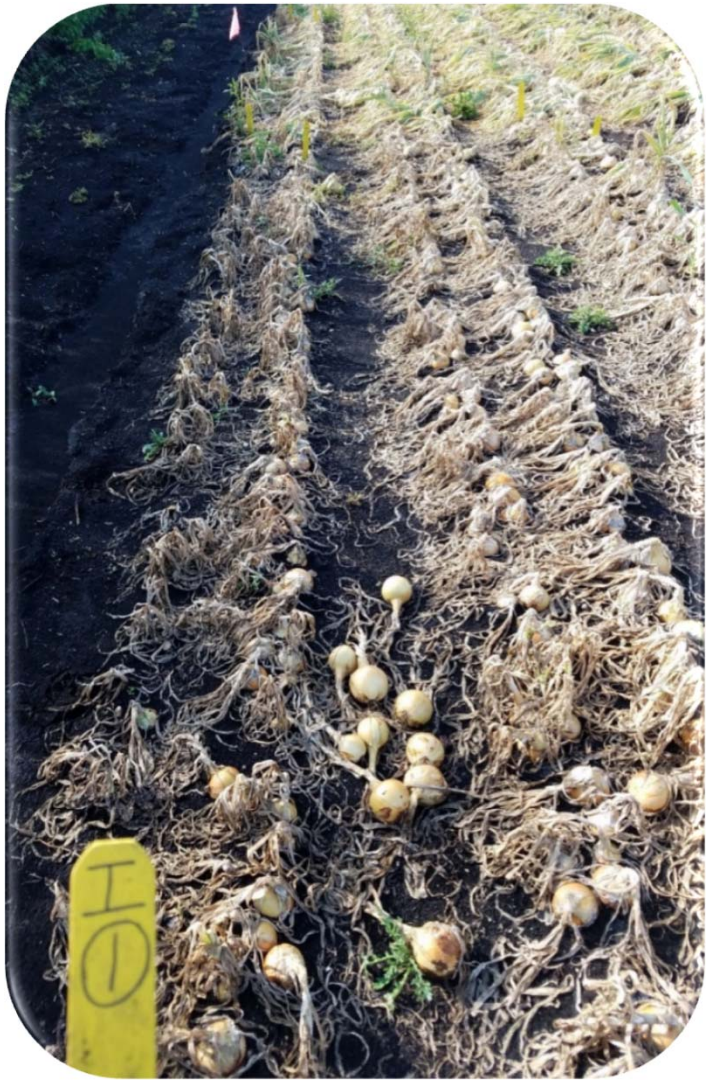
Untreated

Maintained Untreated

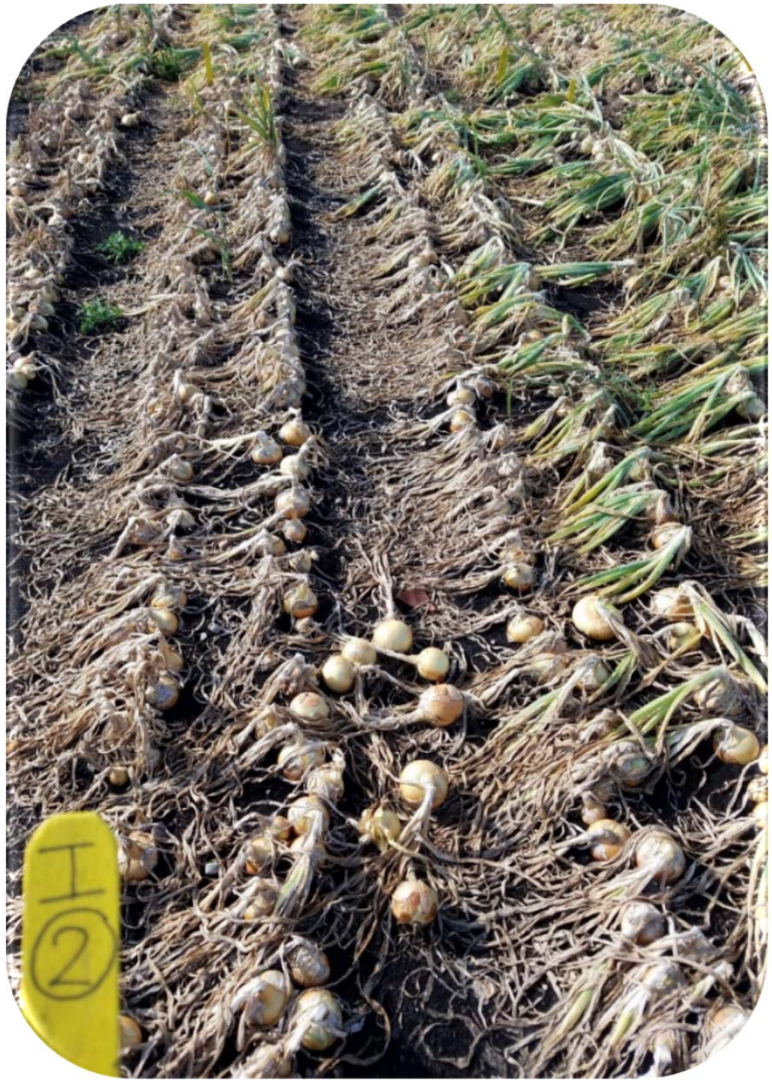
Mancozeb for DM protection; Insecticides for thrips control

2017 SLB Product Trial

SEP 6, 2017



Untreated



Maintained Untreated

2017 SLB Product Trial

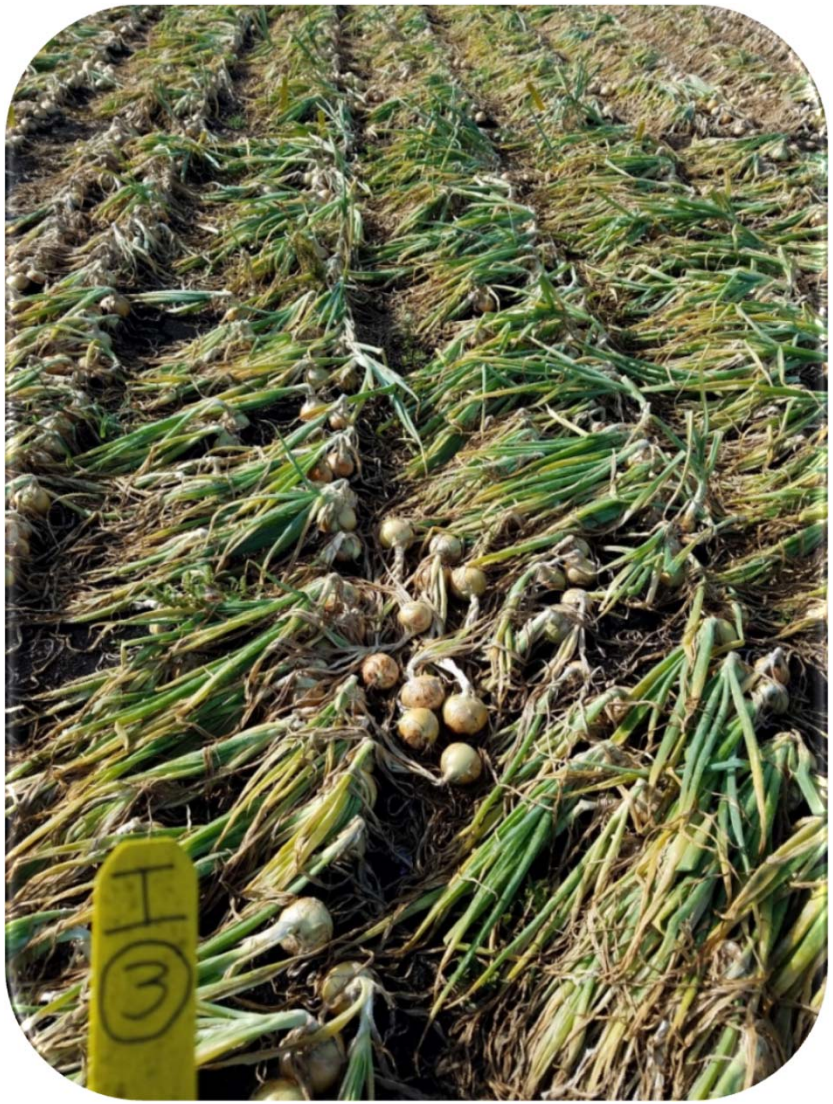
SEP 6, 2017

Luna Tranquility **16** fl oz

Luna Tranquility **12** fl oz

2017 SLB Product Trial

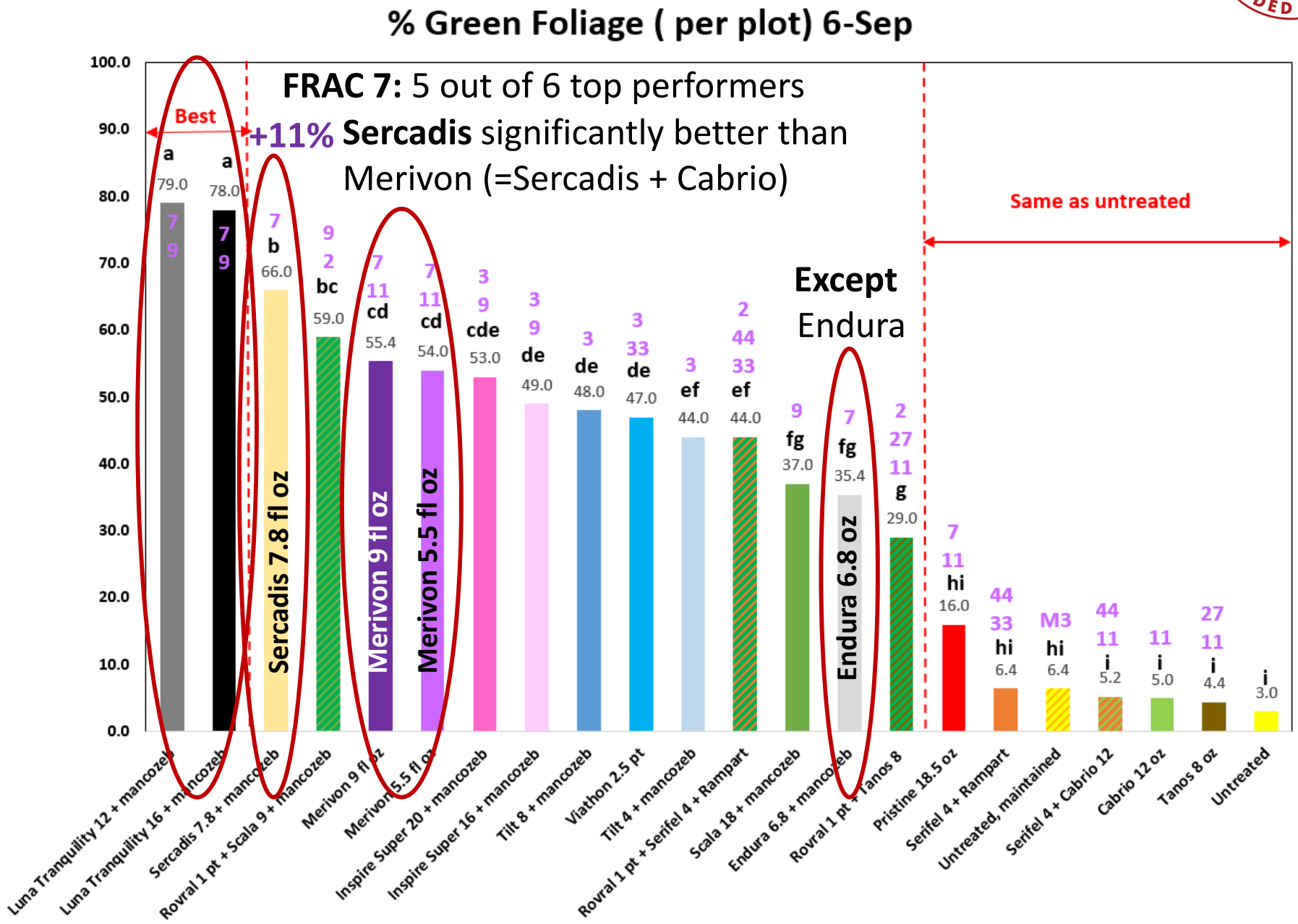
SEP 6, 2017



Merivon **9** fl oz

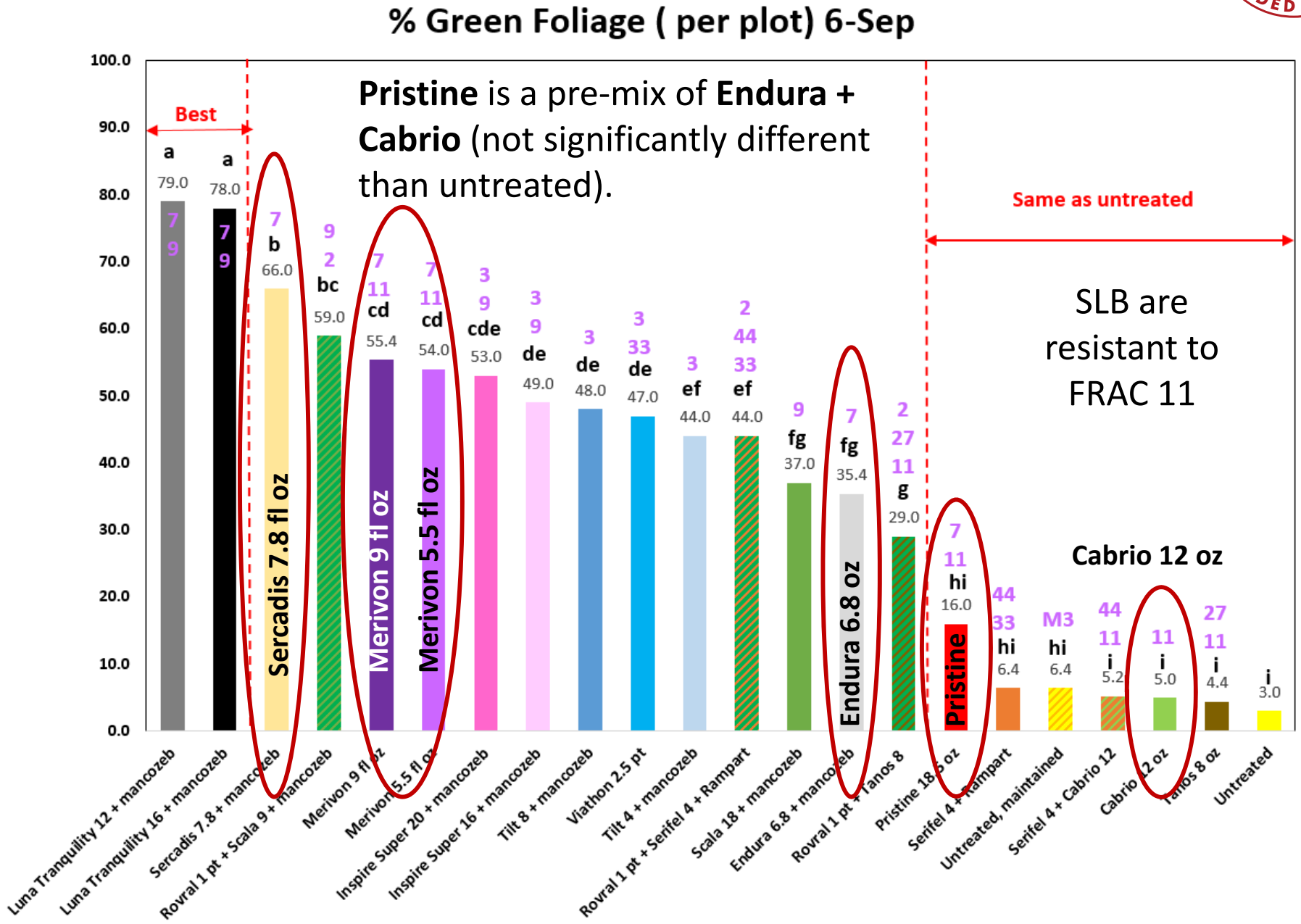
Merivon **5.5** fl oz

2017 SLB Product Trial



Is SLB developing resistance to Endura?

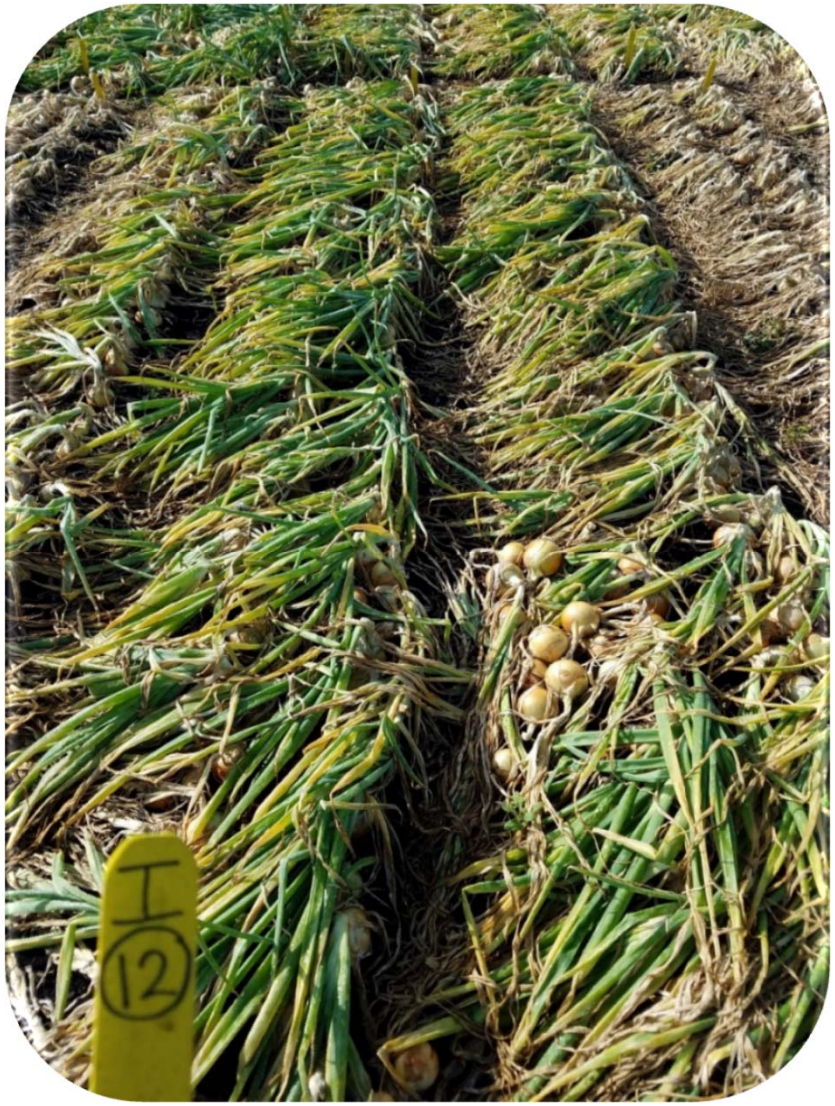
2017 SLB Product Trial



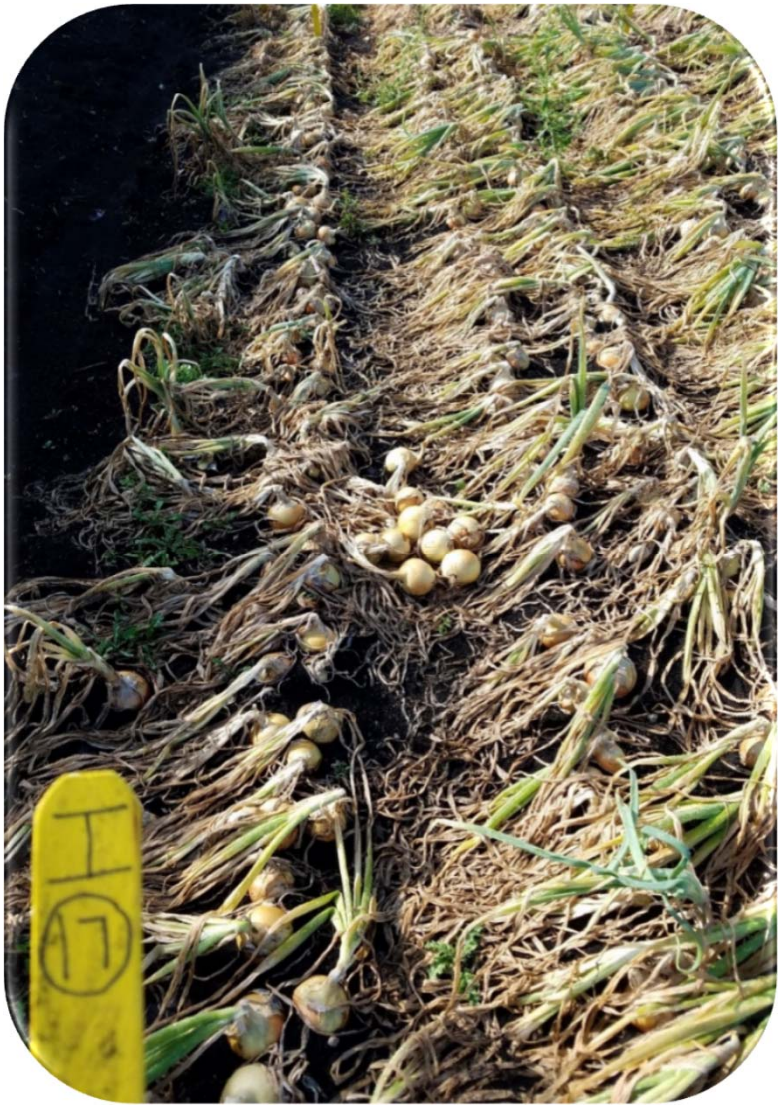
Does carrying a FRAC 11 in a premix drag down effective SLB fungicides?

2017 SLB Product Trial

SEP 6, 2017



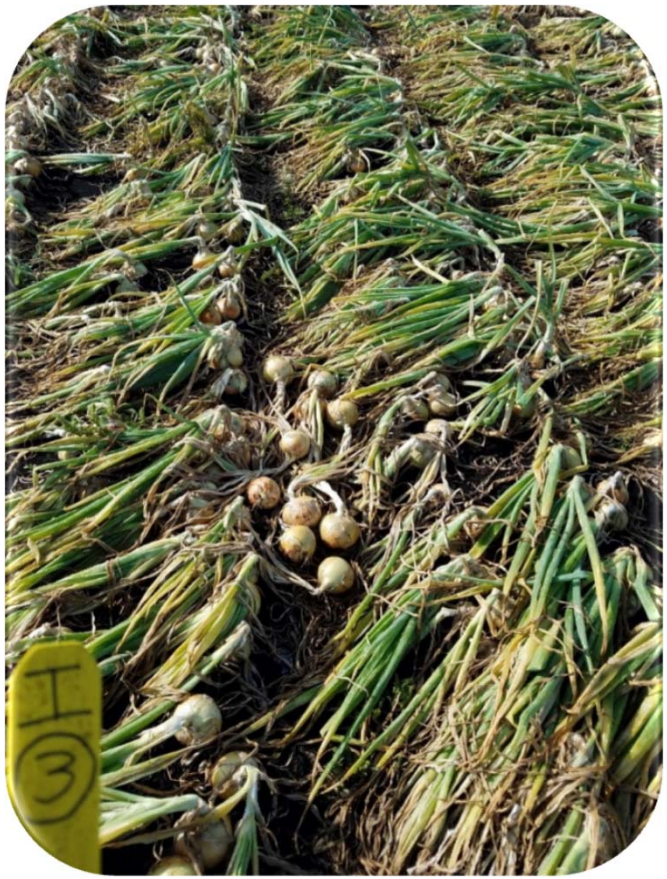
Sercadis 7.8 fl oz



Endura 6.8 oz

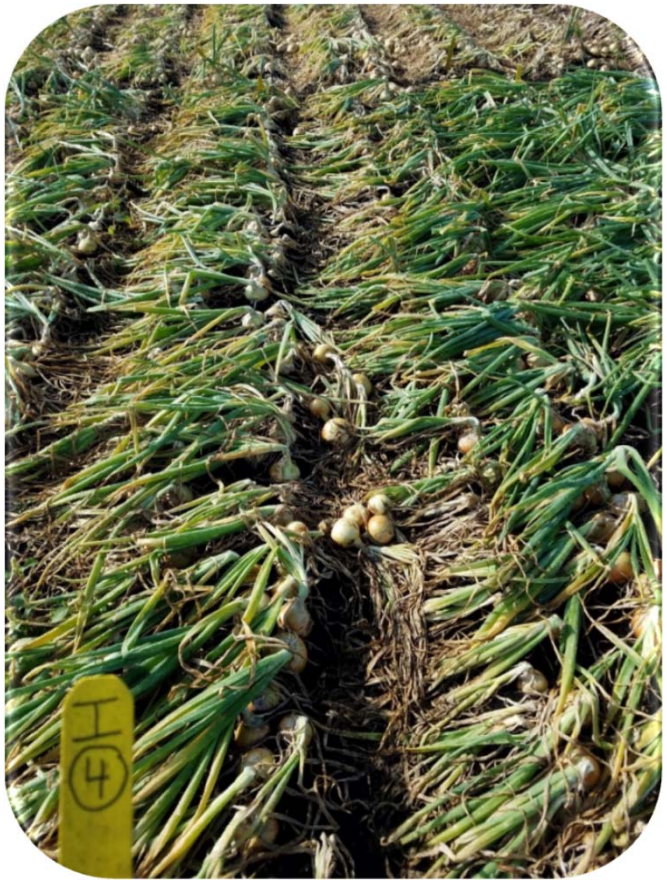
2017 SLB Product Trial

SEP 6, 2017



Merivon **9** fl oz

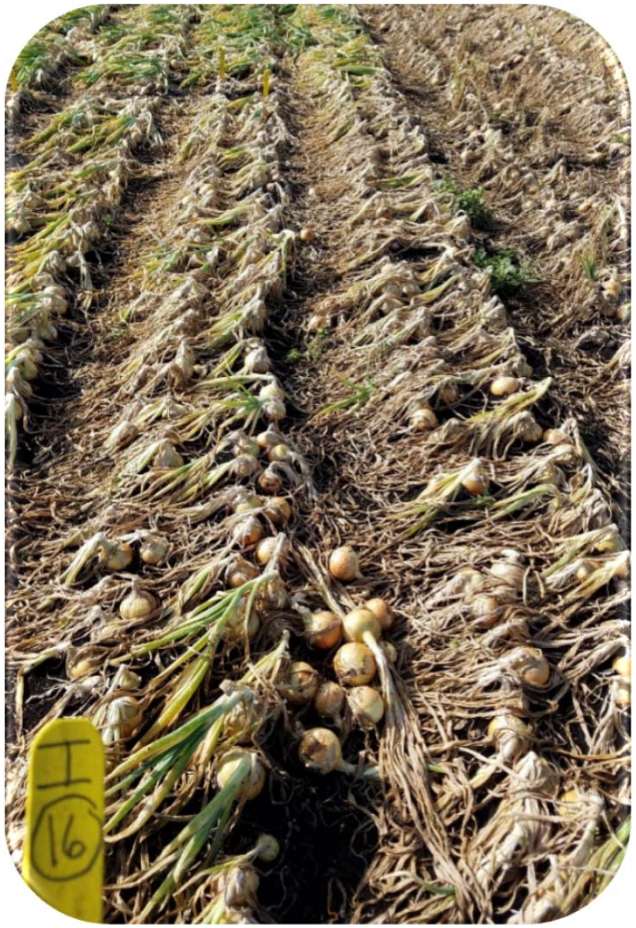
Sercadis 7.8 fl oz



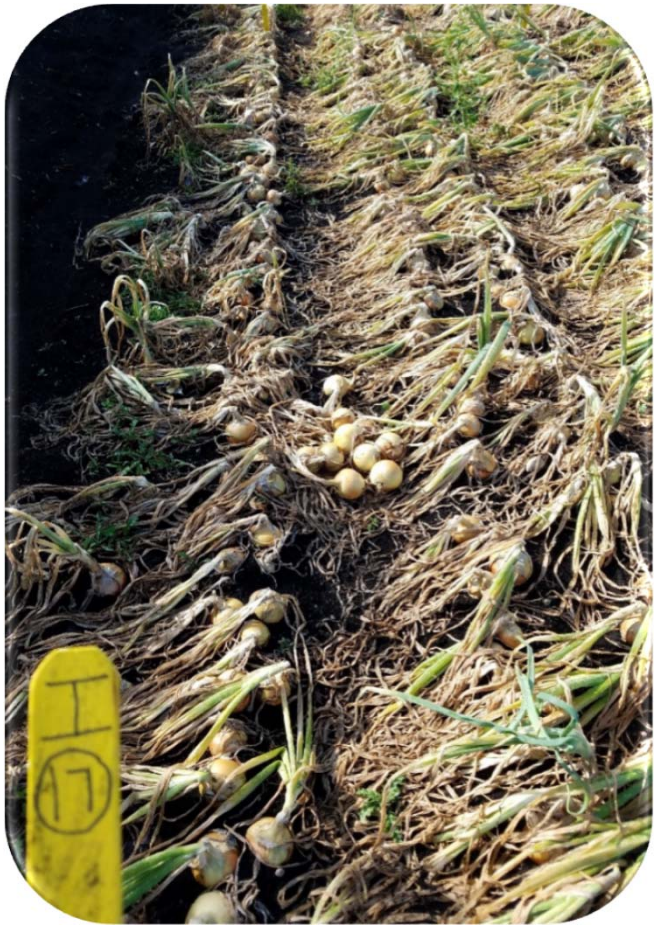
Merivon **5.5** fl oz

2017 SLB Product Trial

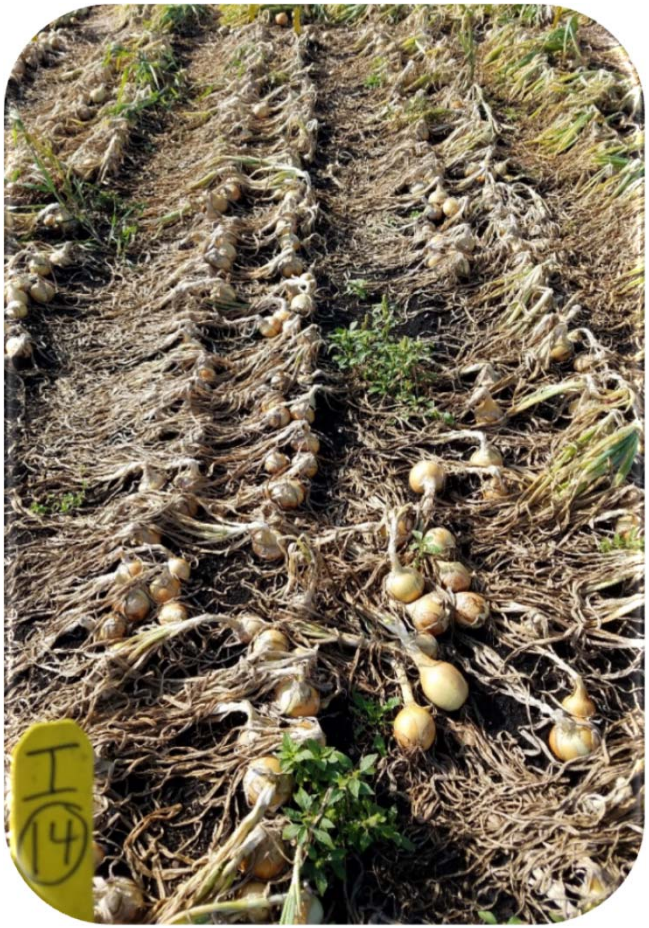
SEP 6, 2017



Cabrio 12 oz

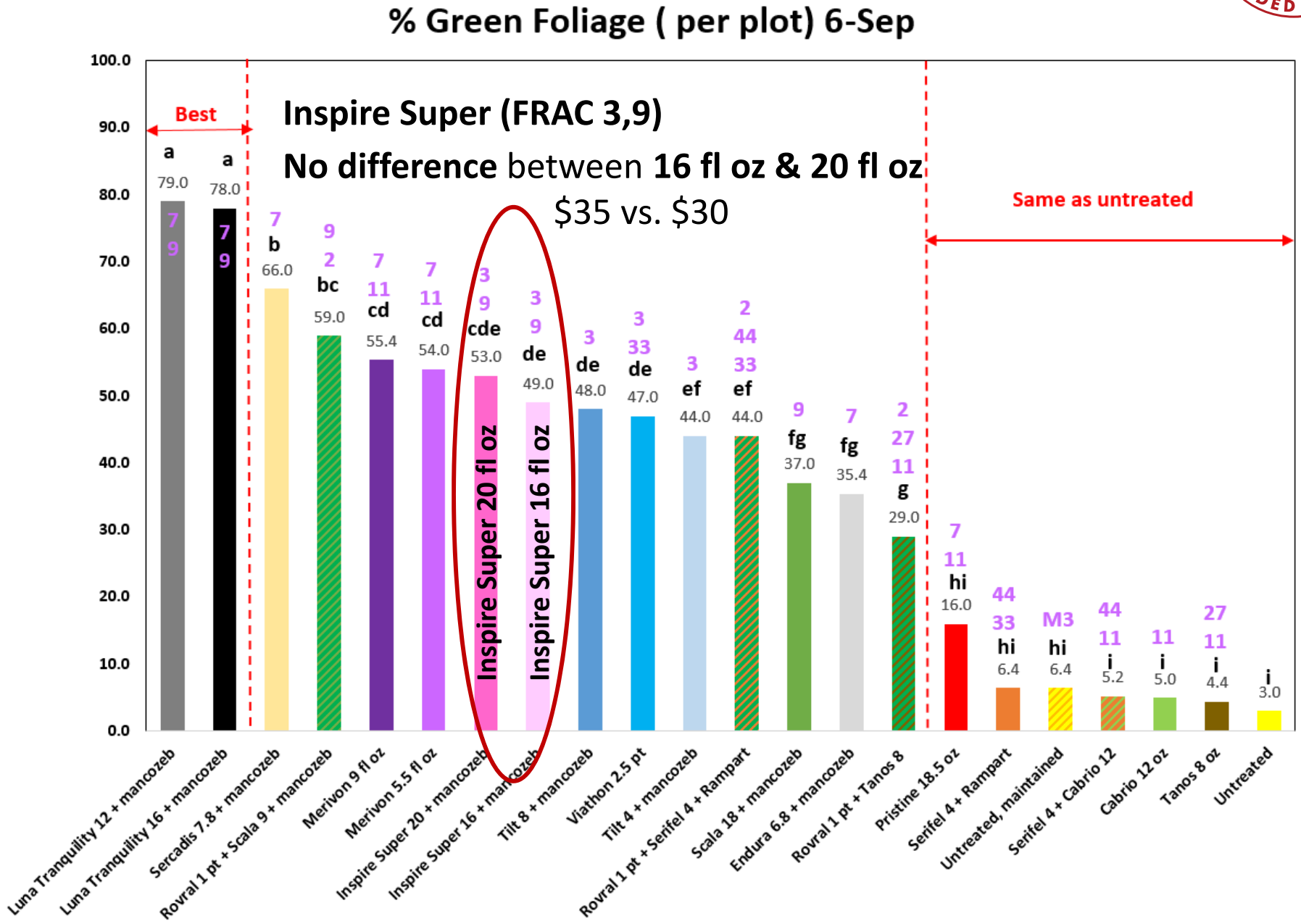


Endura 6.8 oz



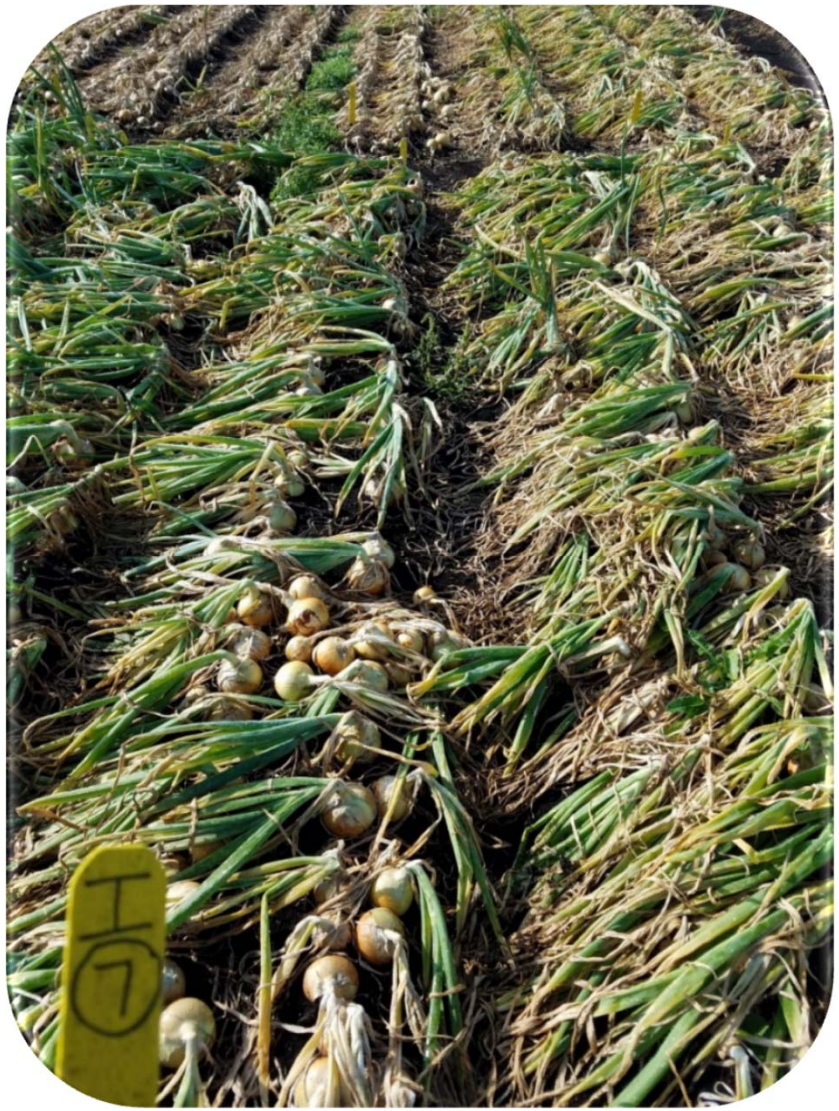
Pristine 18.5 oz

2017 SLB Product Trial



2017 SLB Product Trial

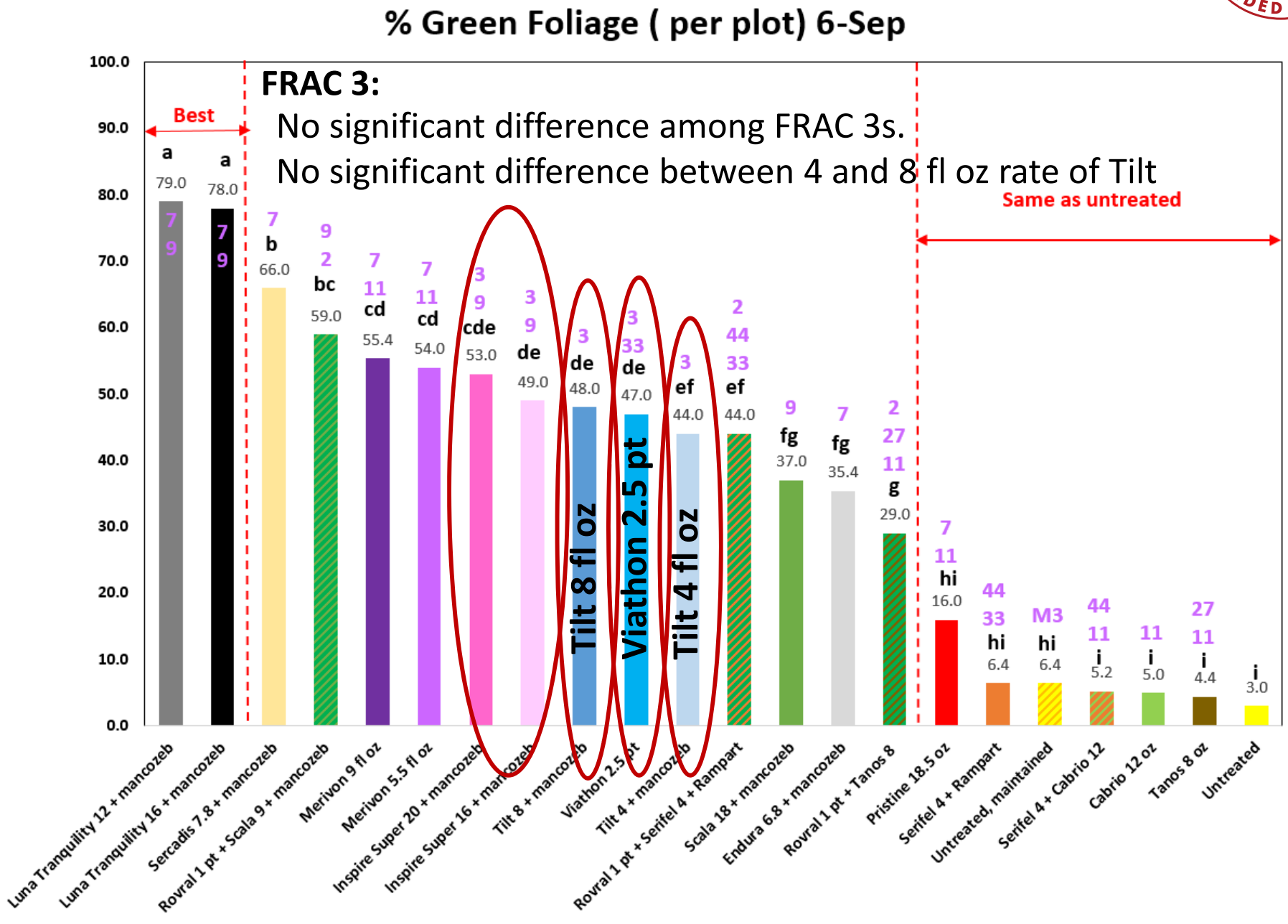
SEP 6, 2017



Inspire Super 20 fl oz

Inspire Super 16 fl oz

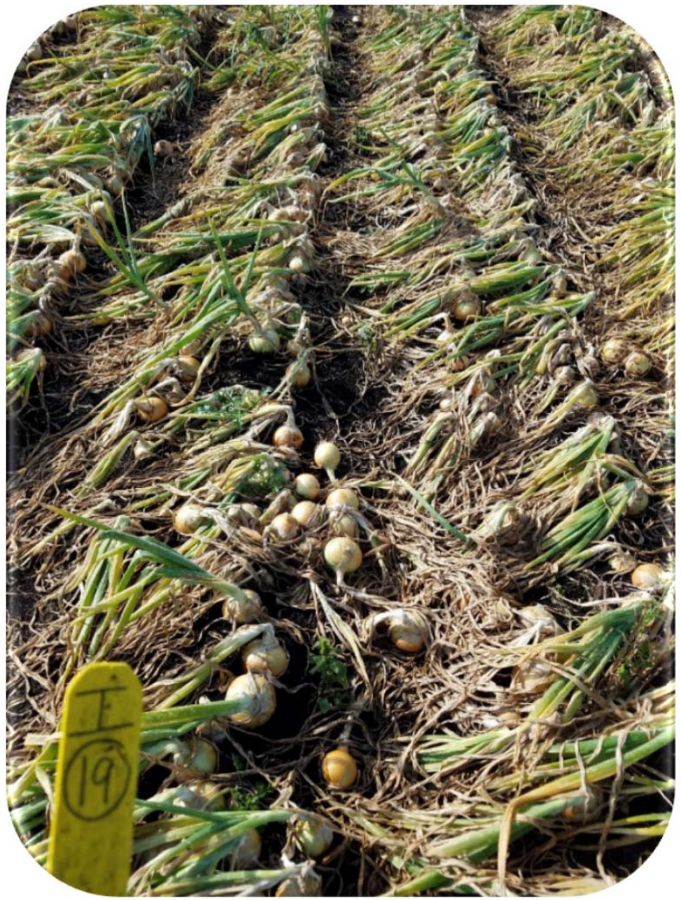
2017 SLB Product Trial



2017 SLB Product Trial

SEP 6, 2017

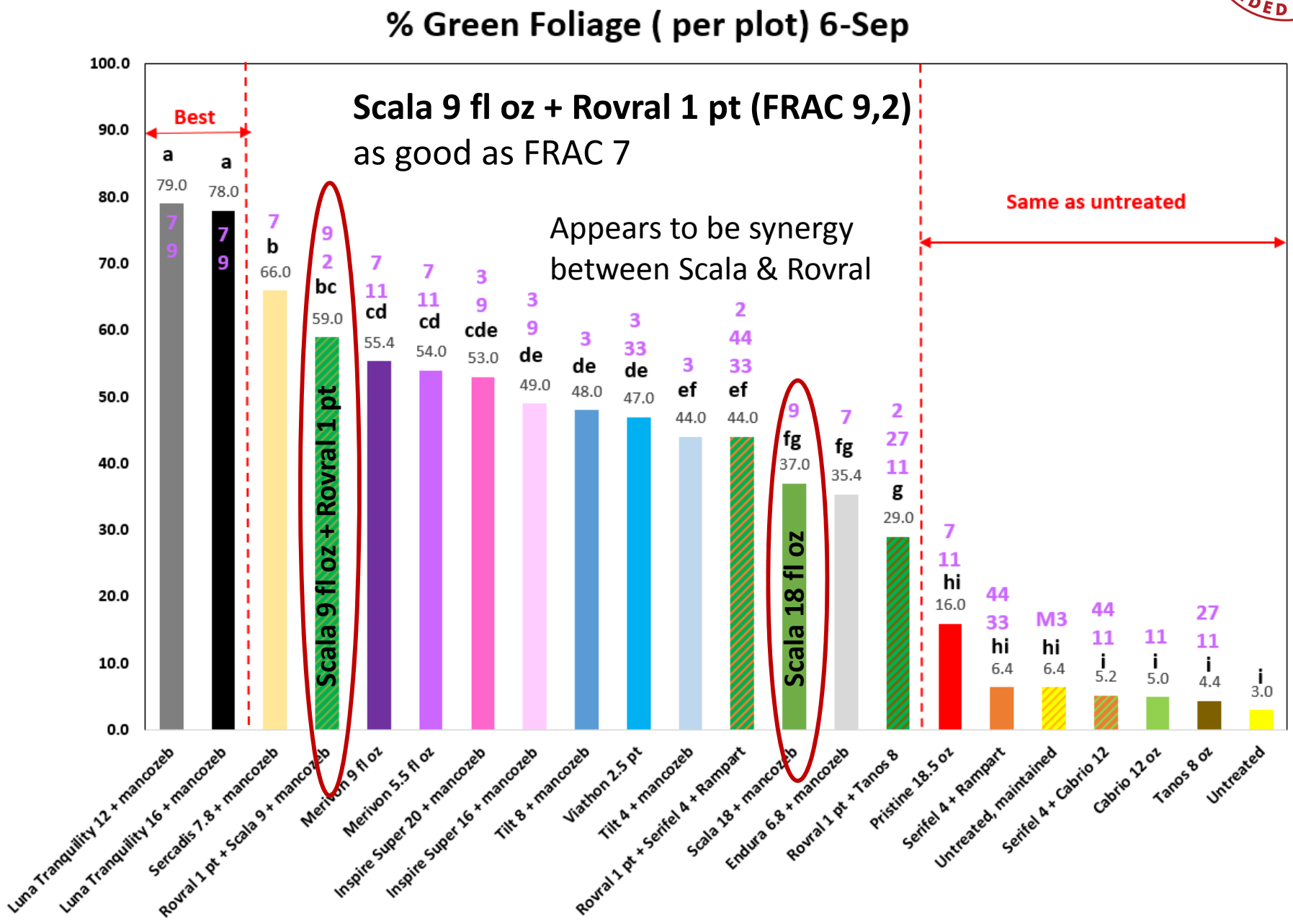
Viathon 2.5 pt



Tilt 4 fl oz

Tilt 8 fl oz

2017 SLB Product Trial



2013 SLB Product Trial, Pembroke

Rovral

Scala 18 oz

Hoepting 2013

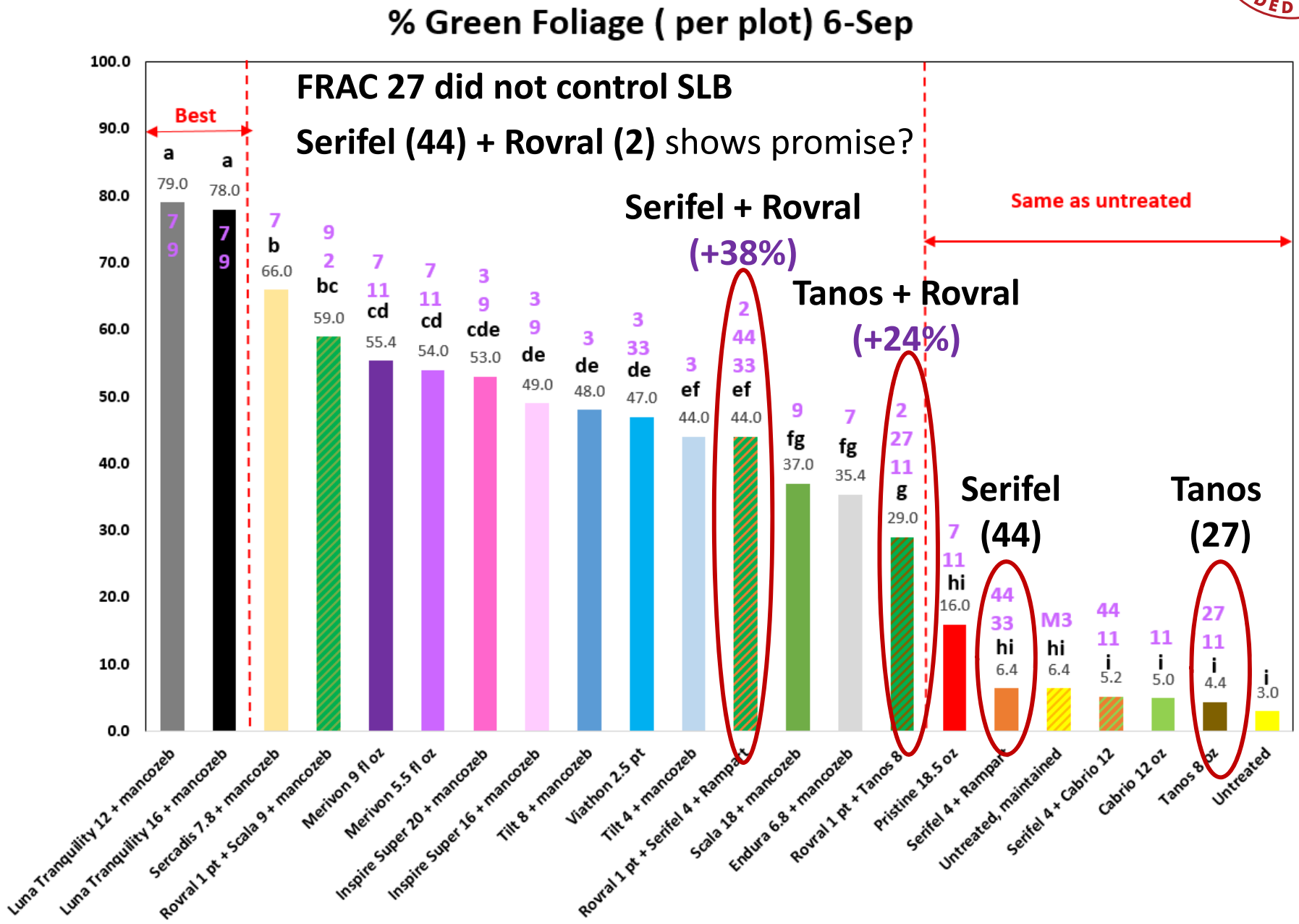
2017 SLB Product Trial

SEP 6, 2017

Scala 18 fl oz

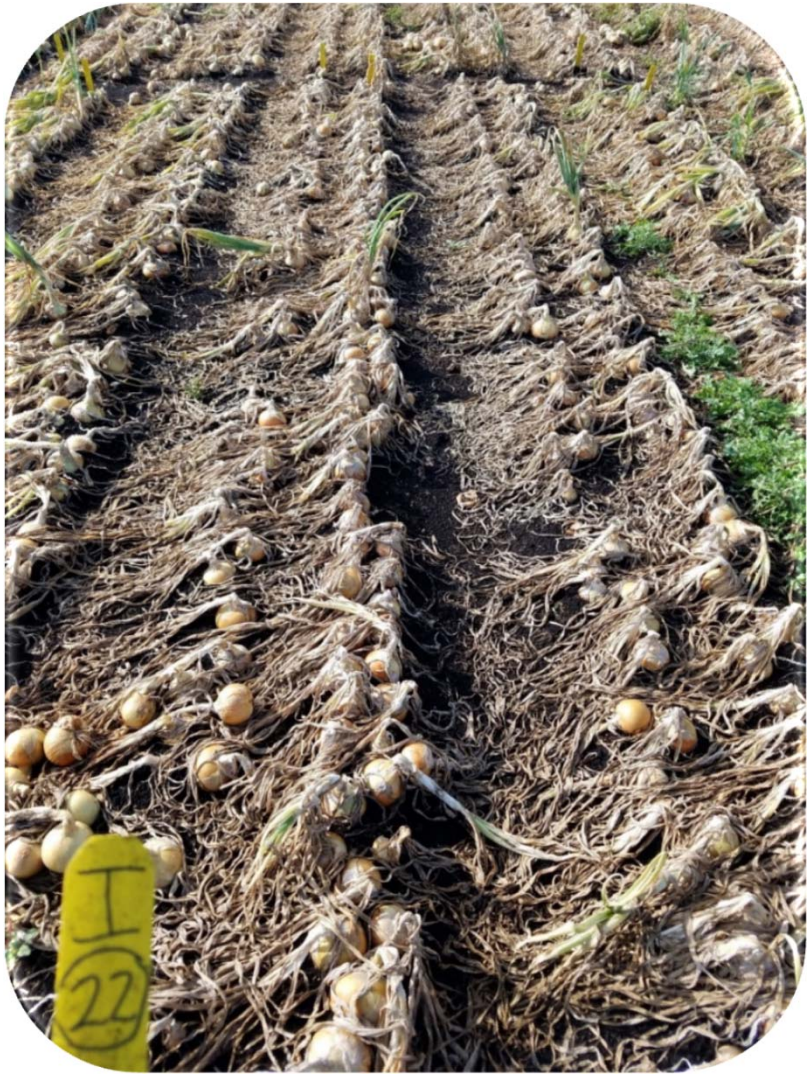
Scala 9 fl oz + Rovral 1 pt

2017 SLB Product Trial



2017 SLB Product Trial

SEP 6, 2017

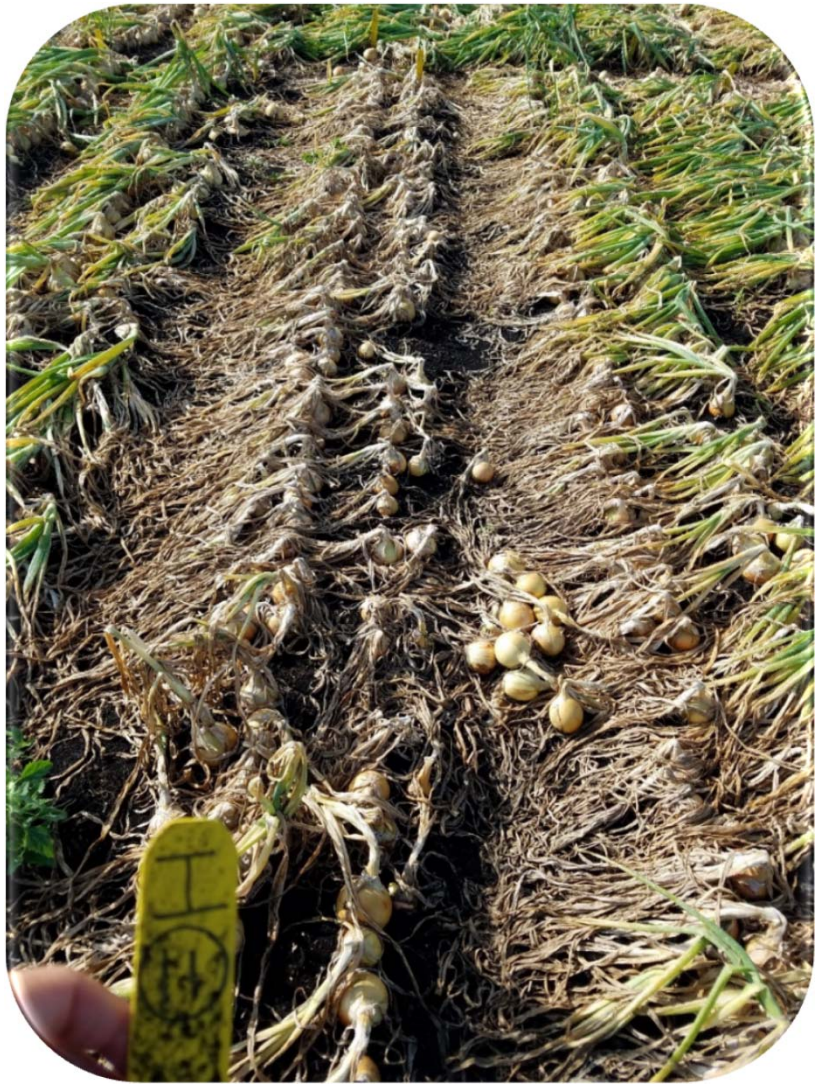


Tanos 8 oz

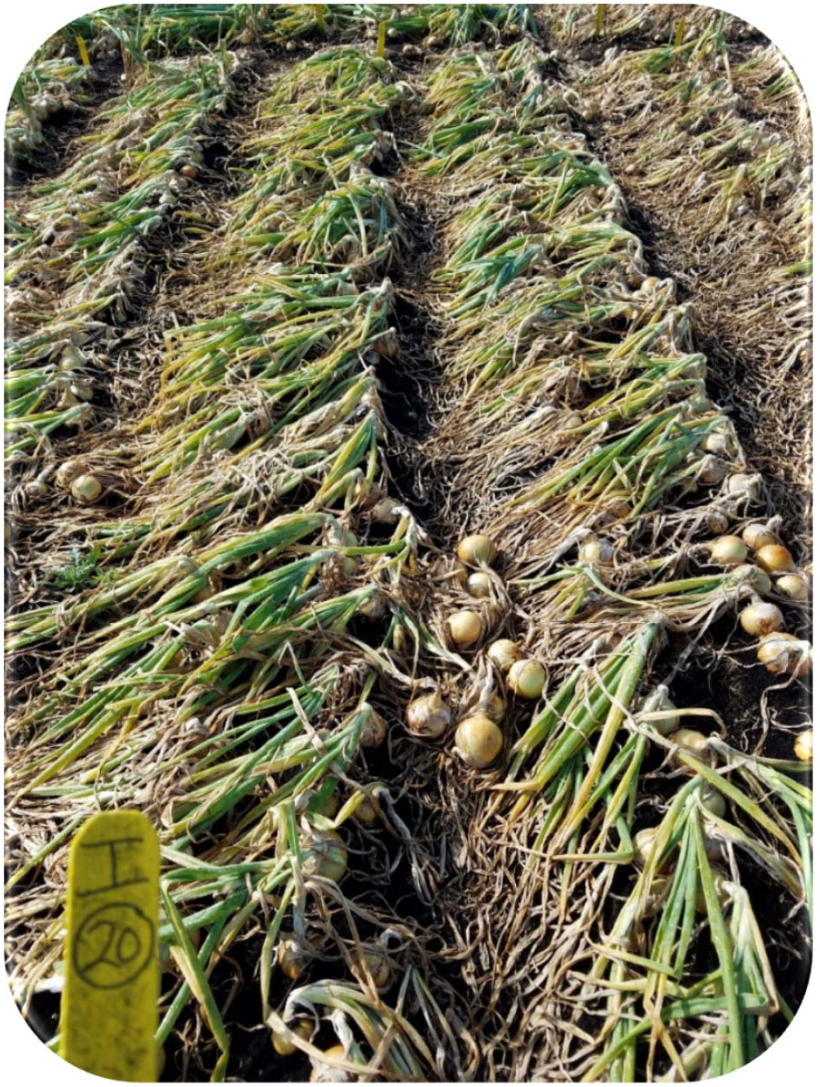
Tanos 8 oz + Rovral 1 pt

2017 SLB Product Trial

SEP 6, 2017



Serifel 4 oz



Serifel 4 oz + Rovral 1 pt

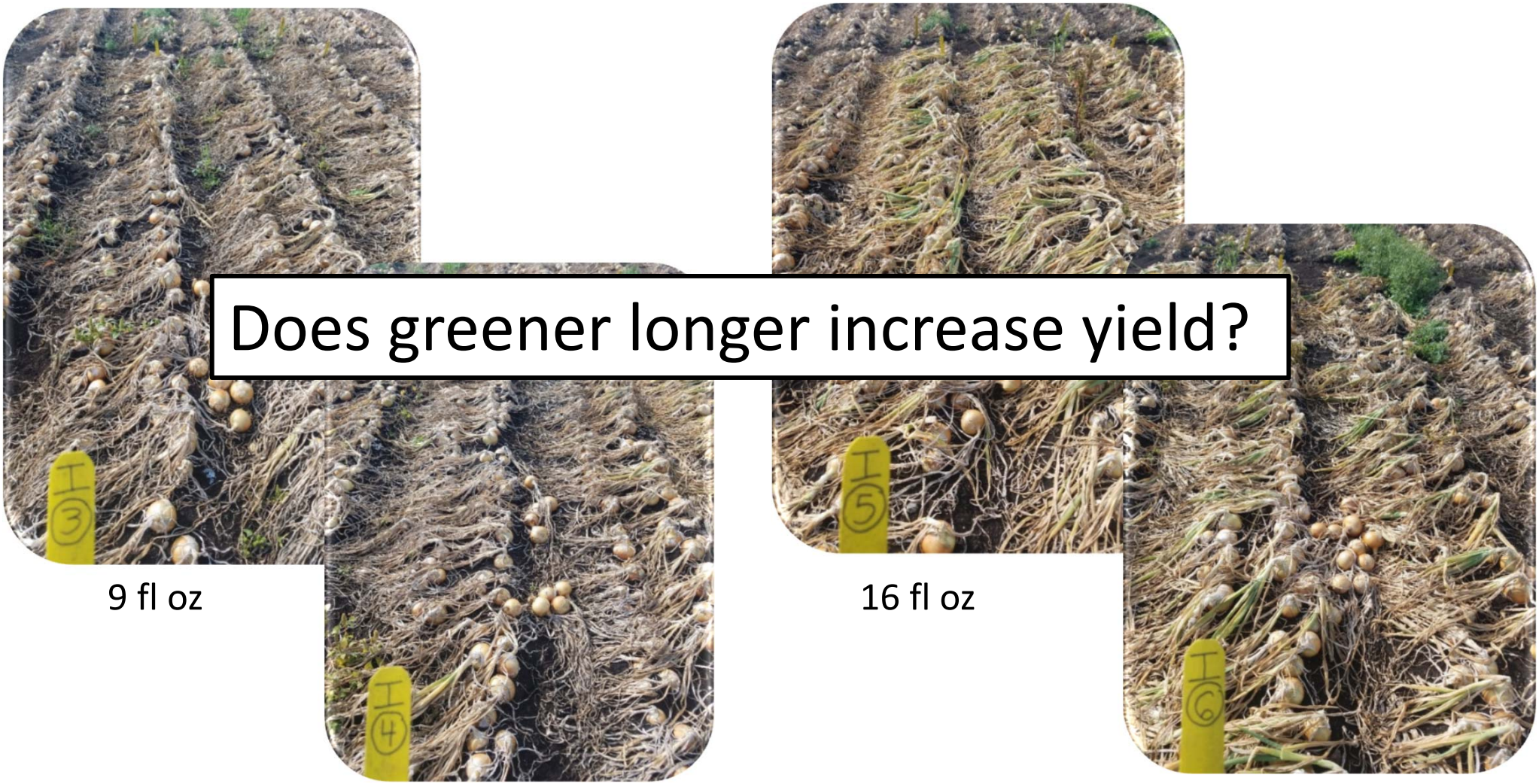
2017 SLB Product Trial
Aug 20 2017

2017 SLB Product Trial
Sep 6 2017

2017 SLB Product Trial
Sep 19 2017

2017 SLB Product Trial
Sep 19 2017

Merivon | **Luna Tranquility**



Does greener longer increase yield?

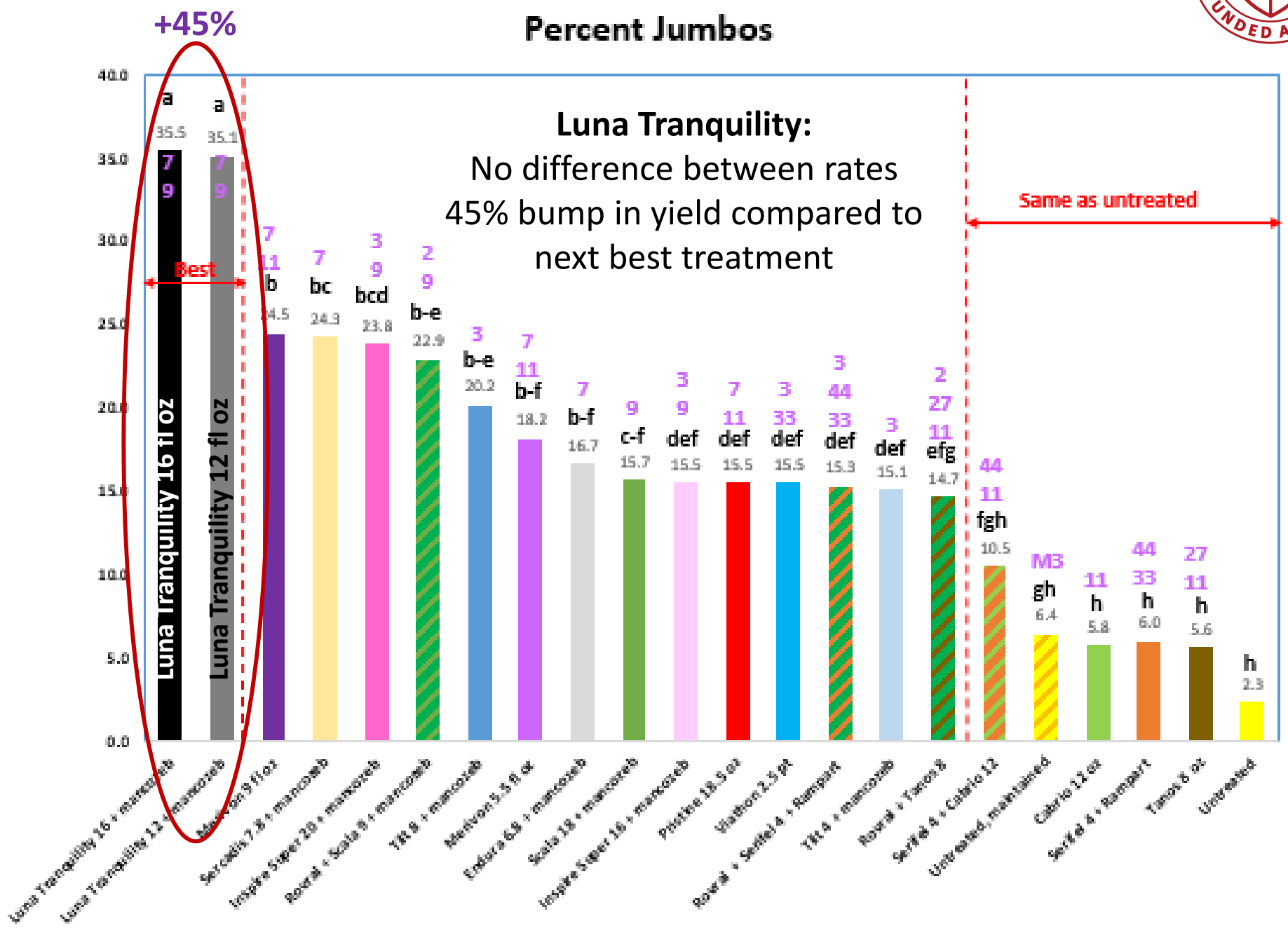
9 fl oz

5.5 fl oz

16 fl oz

12 fl oz

2017 SLB Product Trial



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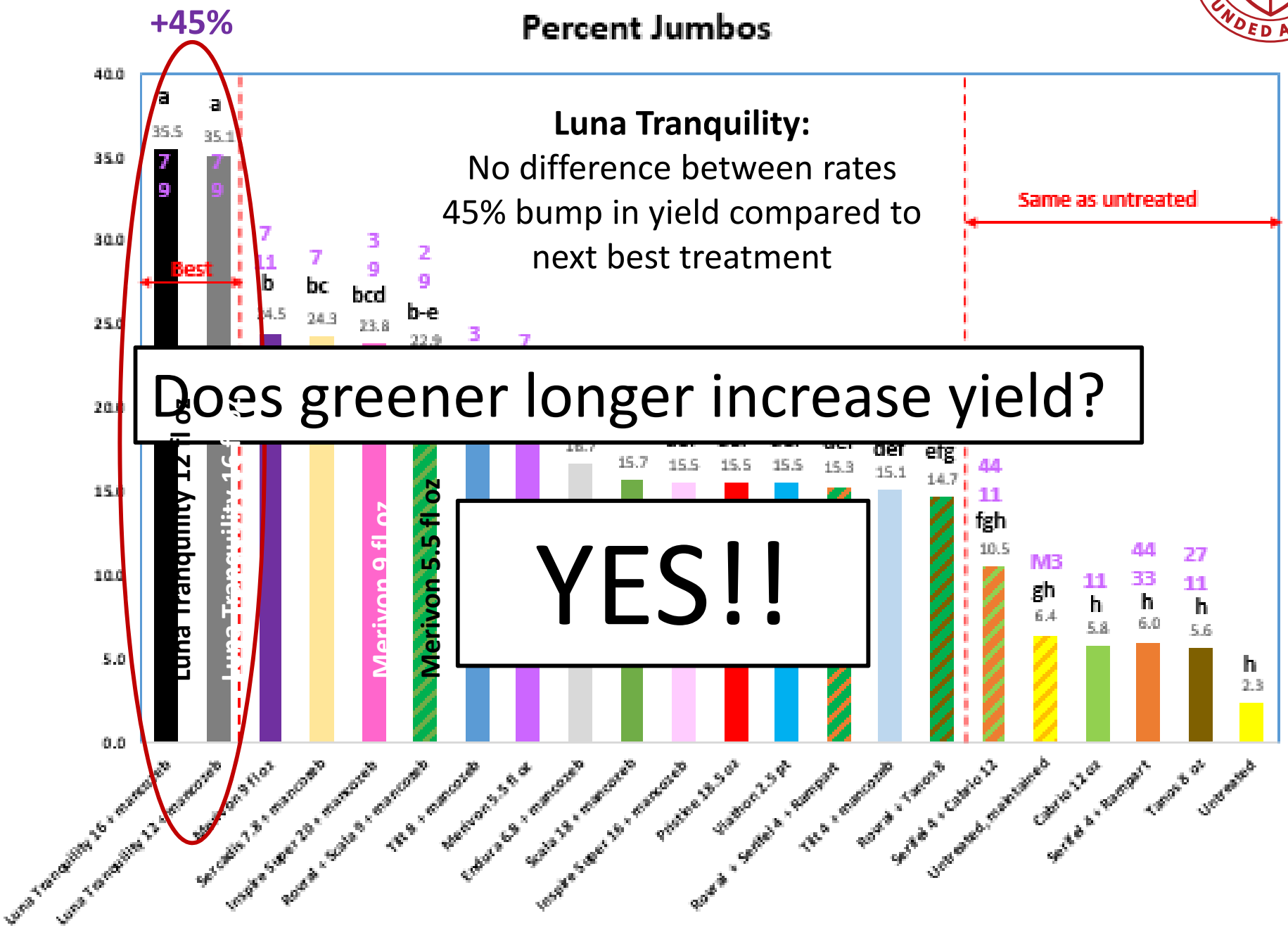
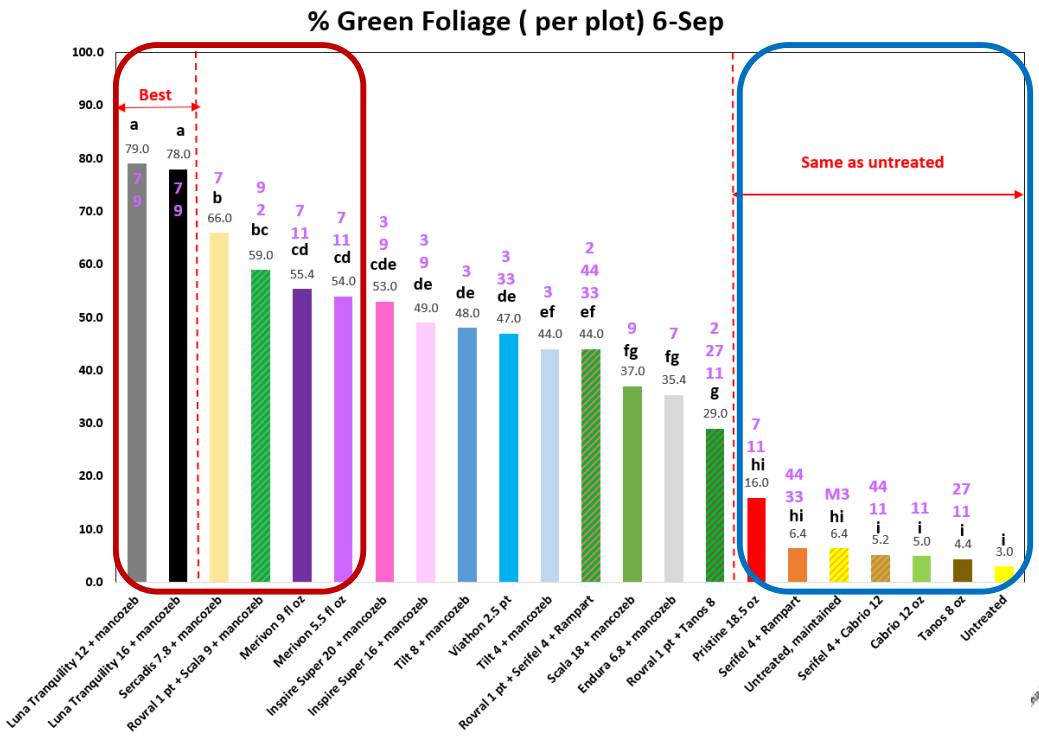
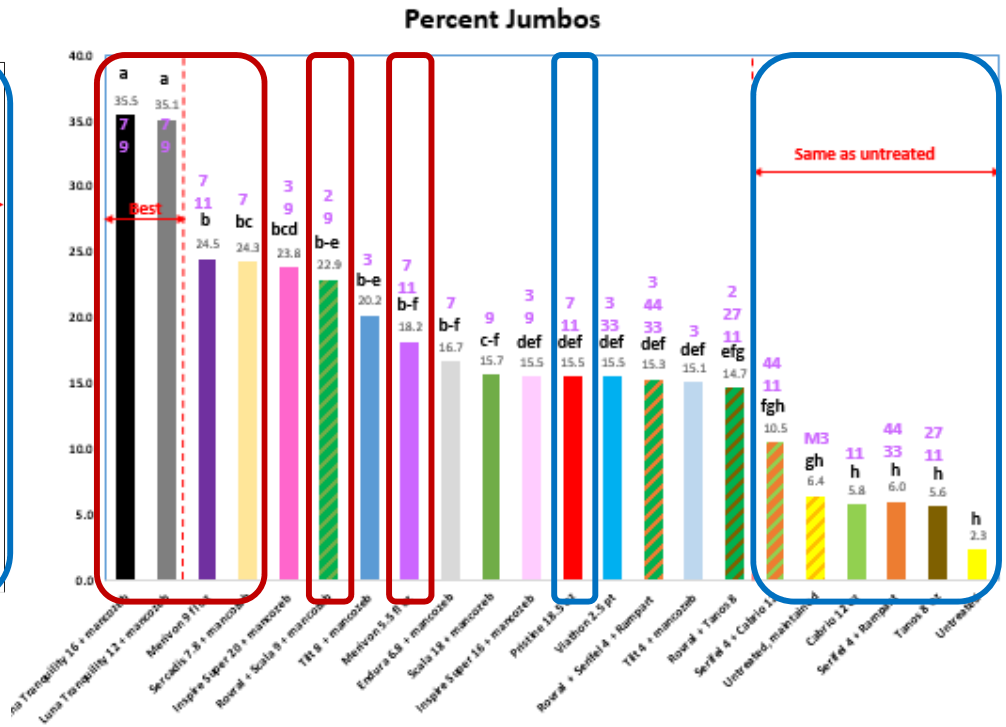


2017 SLB Product Trial

Top 6 best performing treatments

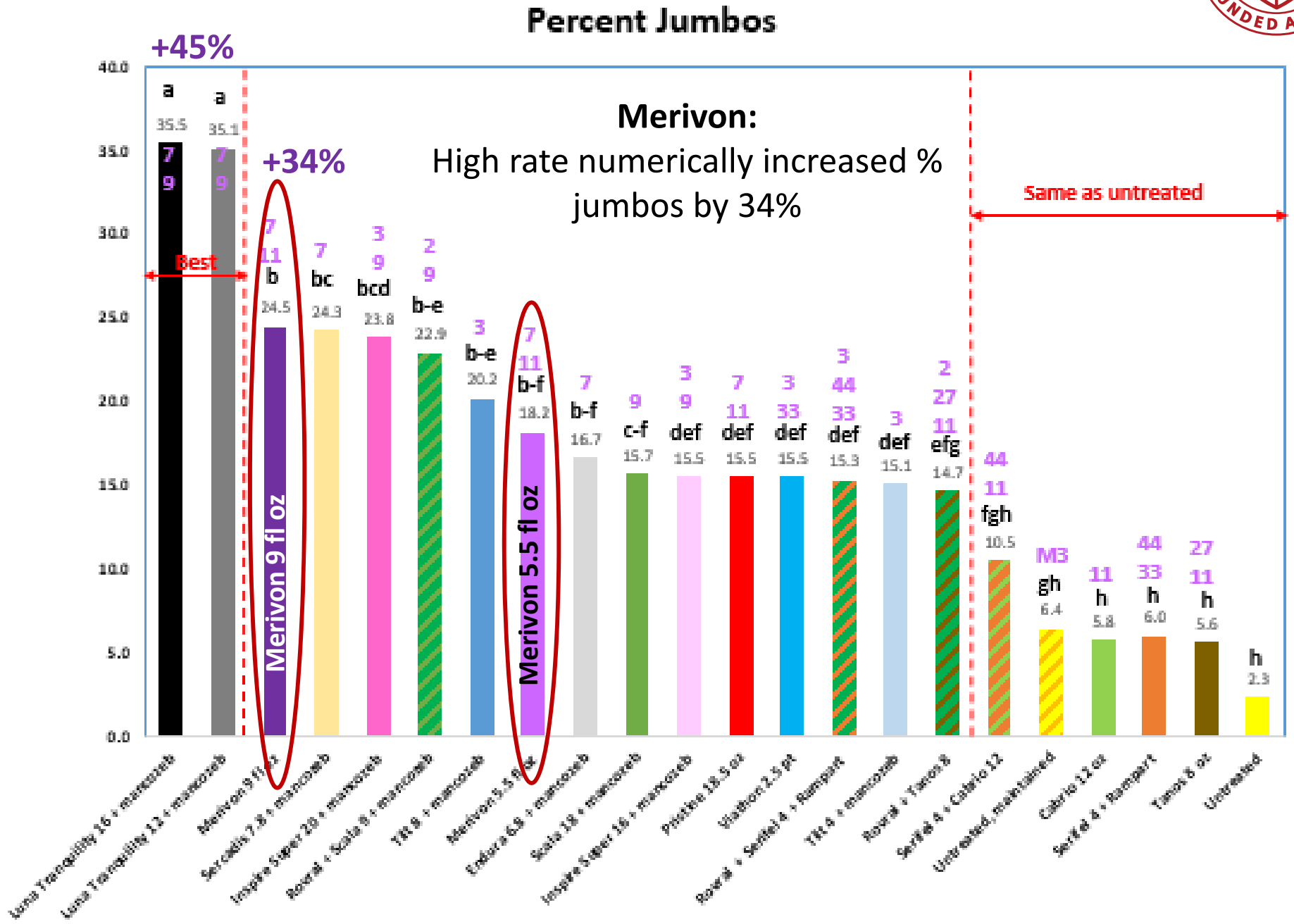
Top 7 worst performing treatments



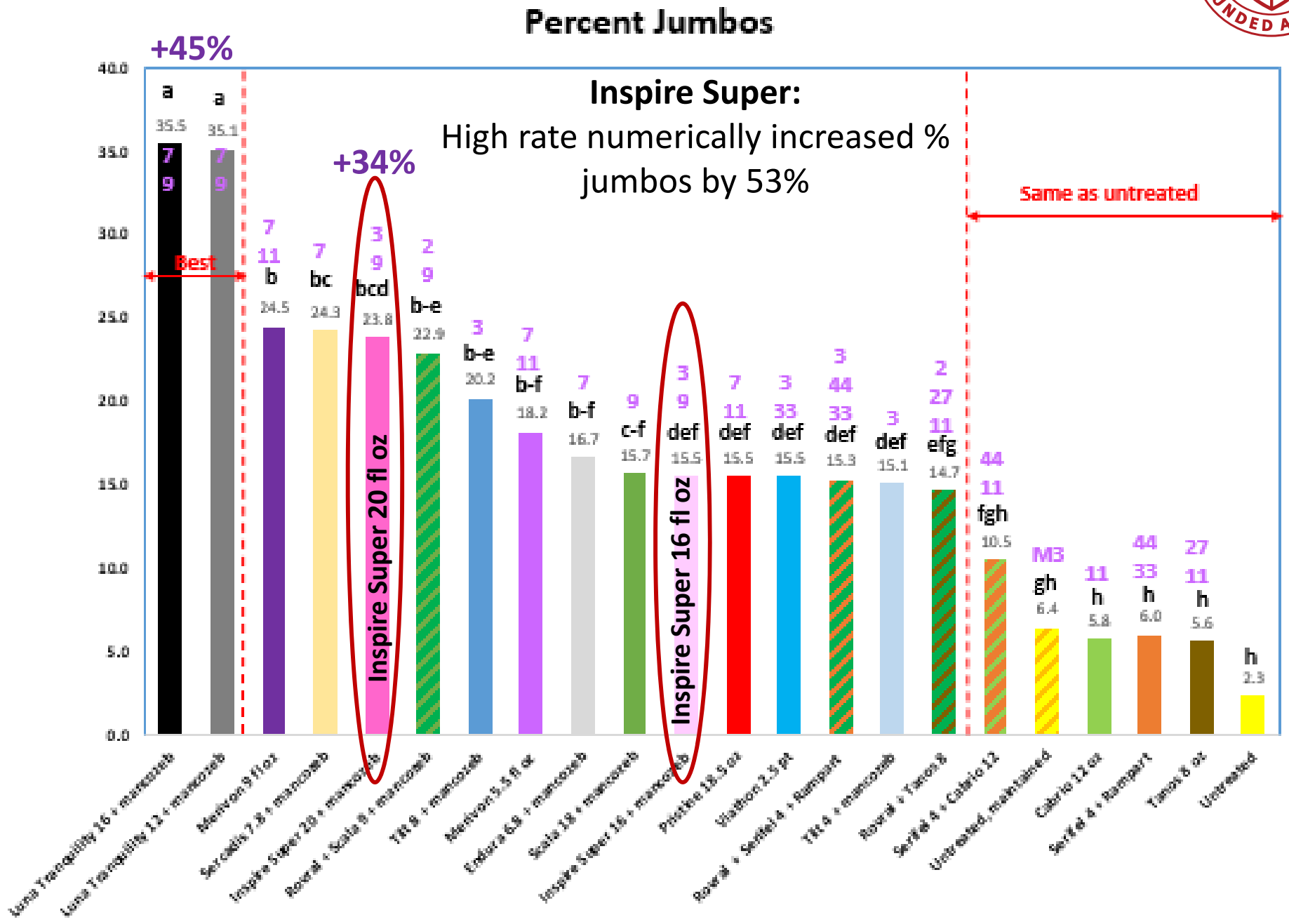


Green foliage (especially late) was closely related to % Jumbos

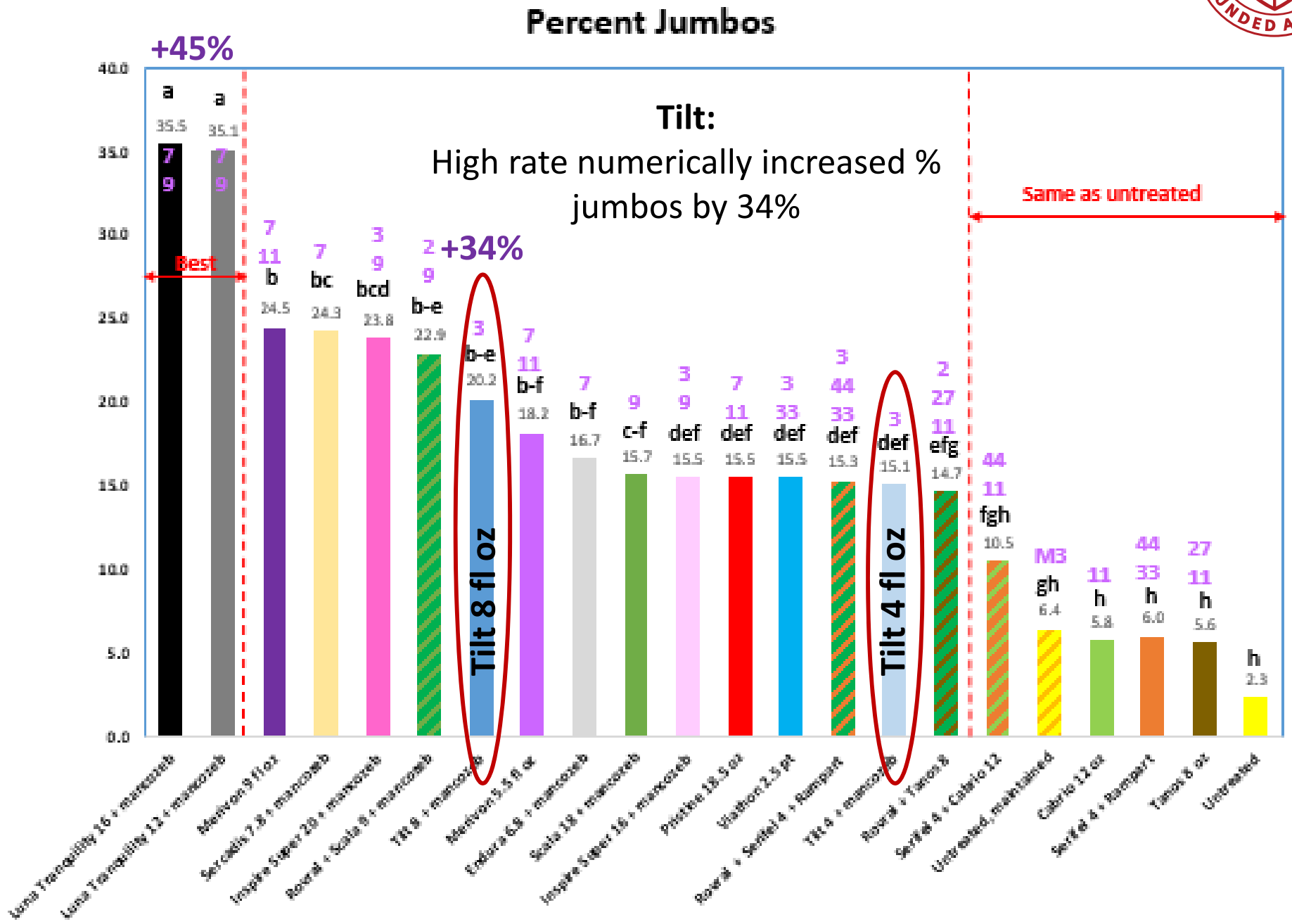
2017 SLB Product Trial



2017 SLB Product Trial



2017 SLB Product Trial



2017 SLB Fungicide Timing Trial

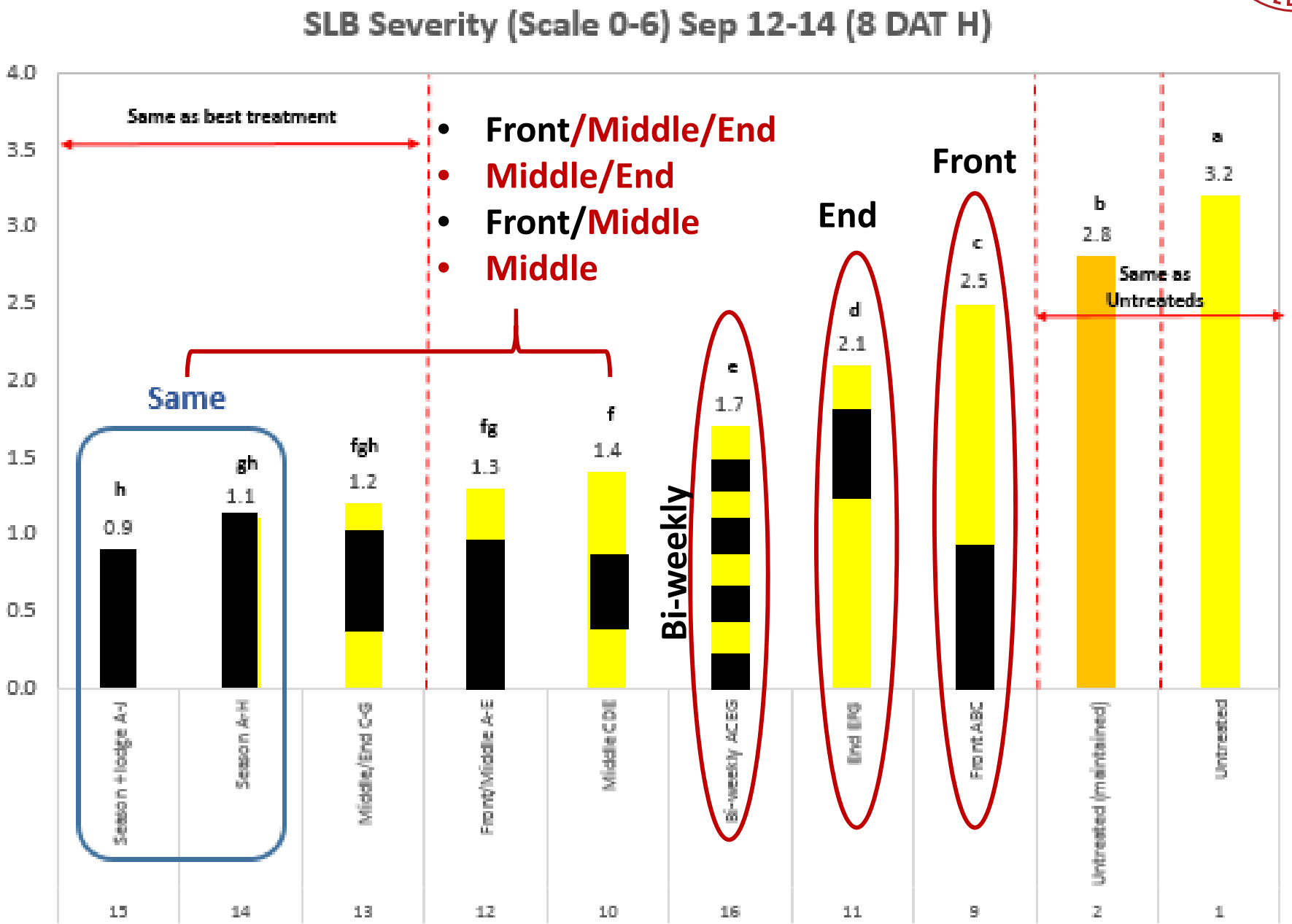
Treatment (Luna T 16 fl oz + NIS)		A	B	C	D	E	F	G	H	I	J
	Date	Jul-18	Jul-23	Jul-28	Aug 6	Aug-15	Aug-23	Aug-29	Sep-5	Sep-12	Sep-20
	Leaf stage	7-8	8	9	8-10	8-10	8-10	8-10	8-10	8-10	7-10
	Bulb stage		start	1”	1-2”	1-2”	2-2+”	2-2+”	2-2+”	2-3	2-3
	lodging							10%	30-50%	30-50%	75%
1	Untreated, no pesticides										
2	Untreated, maintained										
9	Front-loaded	■	■	■							
10	Middle-loaded			■	■	■					
11	End-loaded					■	■	■			
12	Front & middle loaded	■	■	■	■	■					
13	Middle & end loaded			■	■	■	■	■			
14	Season long	■	■	■	■	■	■	■	■		
15	Season long & after lodging	■	■	■	■	■	■	■	■	■	■
16	Bi-weekly	■		■		■		■			

2017 SLB Fungicide Timing Trial
Aug 15, 2017

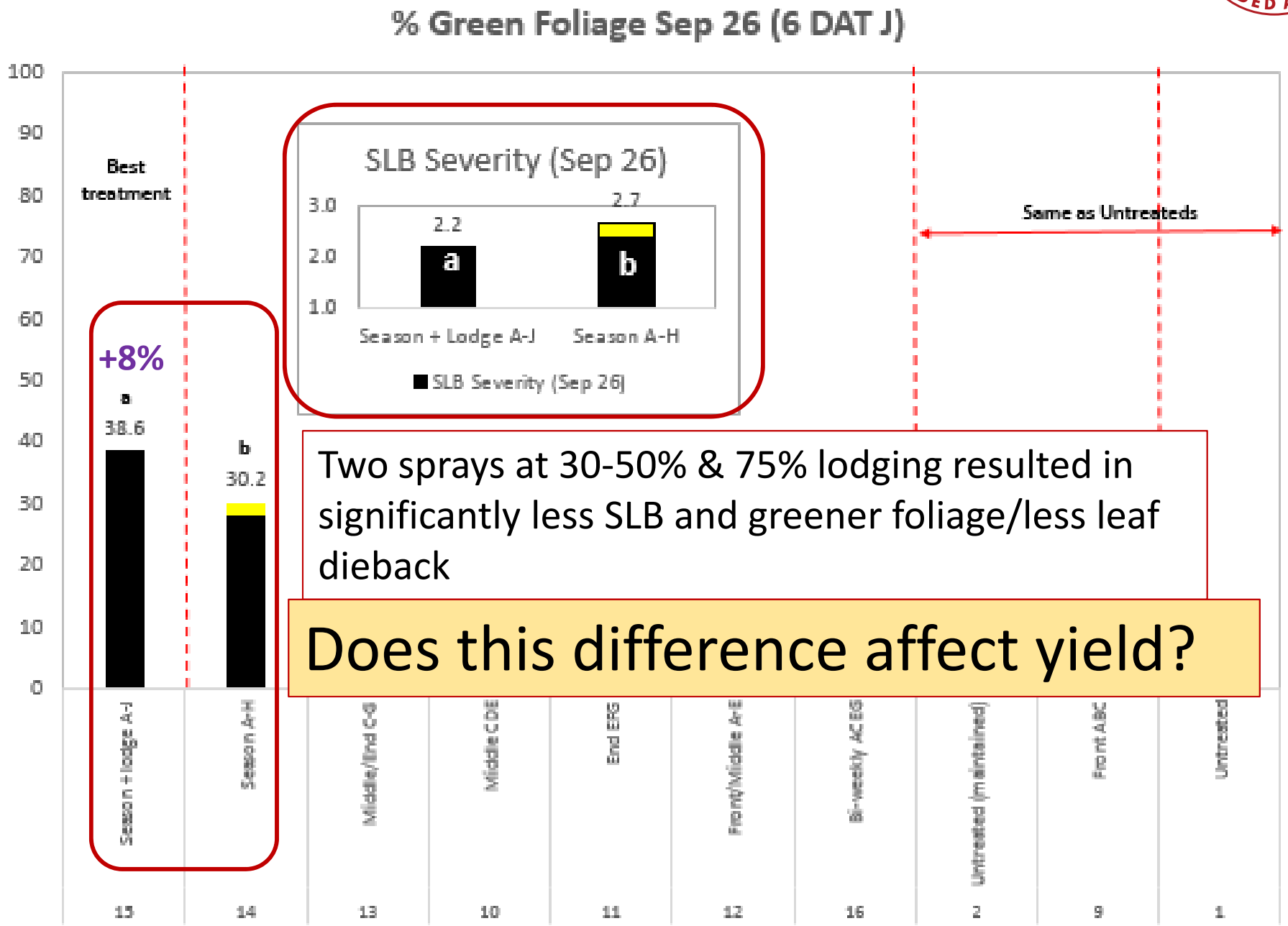
Elba
Variety: Safrane

2017 SLB Fungicide Timing Trial
Aug 29, 2017

2017 SLB Fungicide Timing Trial



2017 SLB Fungicide Timing Trial



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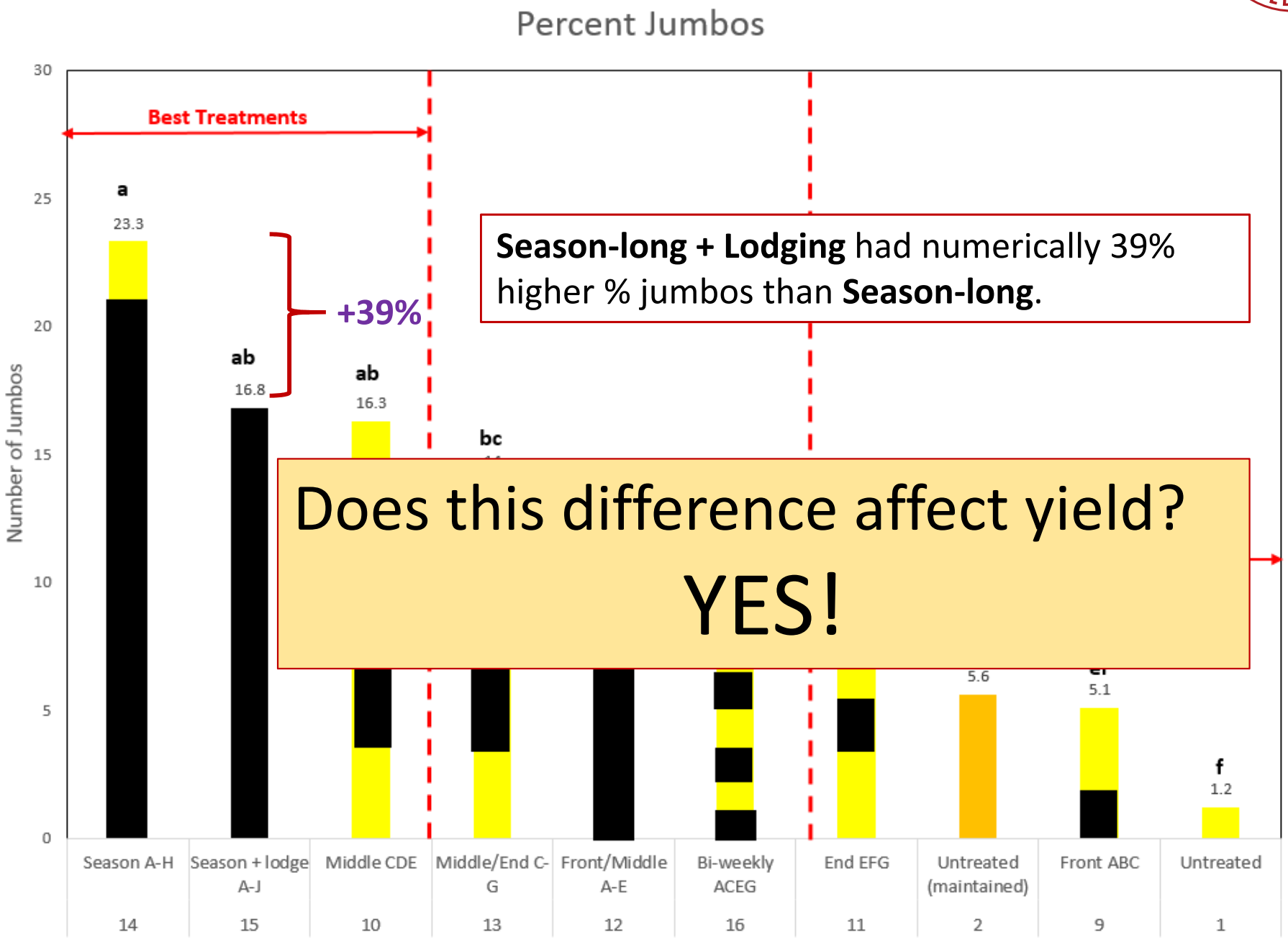
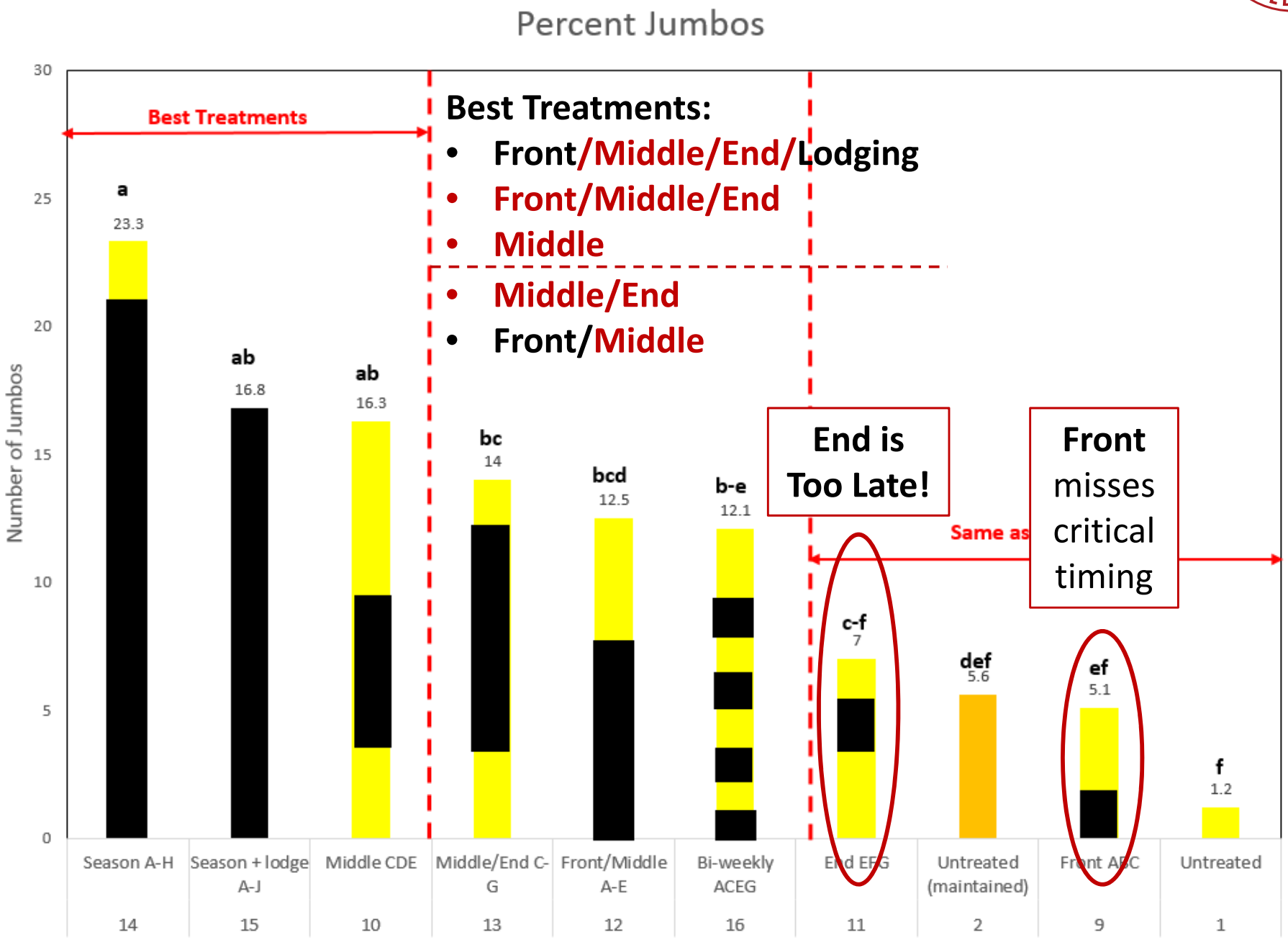


2017 SLB Fungicide Timing Trial



2017 SLB Fungicide Timing Trial

AUG 15, 2017

Season-long:

4 apps: start Jul-18 (pre-bulb)

~15-20% excessive dieback
+ SLB invading necrotic tissue
= TOO LATE!

End Loaded

Just before 1st spray

2017 SLB Fungicide Timing Trial

SEP 13, 2017

Front ABC

Middle CDE

End EFG

2017 SLB Fungicide Timing Trial

SEP 13, 2017

Front Loaded
(no thrips control)

Untreated
(no SLB or thrips control)

Maintained Untreated
(With thrips control)

Both SLB and thrips contribute to excessive leaf dieback

2017 SLB Fungicide Timing Trial

SEP 13, 2017

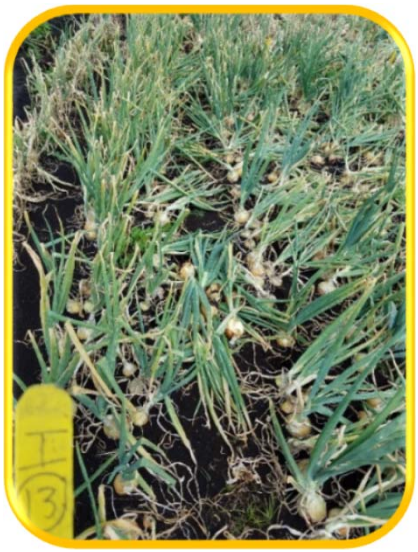
BEST


Front ABC


Middle CDE


End EFG


Untreated


Front/Middle A-E


Middle/End C-G


Season-long A-H


Bi-weekly ACEG

2017 SLB Fungicide Timing Trial

Critical SLB Fungicide Timing:

- Start at 1” bulb
- During Mid to late-July
- Weekly applications
- Until.. “The End”
  - ~50% lodging
  - After lodging for additional size
  - Depends…

Spray By Number
For Fungicide Resistance

ACCEPTED
FOR REGISTRATION

JULY 24 2015

New York State Department
of Environmental Conservation
Division of Materials Management
Pesticide Product Registration

Doc ID: 542853

GROUP 3 9 FUNGICIDES

PULL HERE TO OPEN

InspireSuper®

syngenta

Fungicide

Active Ingredients:

Difenoconazole* 8.4%

Spray By Number For Fungicide Resistance: The Rules (on Labels)

- **Luna Tranquility, Merivon, Inspire Super** and **Endura** may not be applied in more than **two** sequential applications before rotated away to different FRAC groups.
- **Quadris Top** may not be applied more than **one** time before rotating away to different chemical classes.
- Maximum allowable applications per season (using highest label rates):
  - Tilt, Viathon – **max 2 apps**
  - Scala, Luna Tranquility, Merivon – **max 3 apps**
  - Quadris Top, Inspire Super – **max 4 apps**
- Maximum use of difenaconazole (FRAC 3 in Quadris Top and Inspire Super) is 0.46 lb per acre per season
  - **No more than a total of 4 apps total of Inspire Super and Quadris Top (when maximum rates are used)**
- Maximum use of pyrimethanol (FRAC 9 in Luna Tranquility = Scala) is 2.1 lb per acre per season.
  - After 3 apps of Luna Tranquility, up to 24 fl oz of Scala remaining

Cornell Onion Fungicide Cheat Sheet

Cornell Onion Fungicide "Cheat-Sheet" for Leaf Diseases in New York

Compiled by Christy Hoepting, Cornell Cooperative Extension Program, July 2017.

Trade name	Active ingredient	FRAC[1] code	Relative Disease Control Rating[2]			Rotation restrictions	Rate (product/A)	Maximum allowable per season	
			BLB[3]	SLB	DM			Total Amount	No. of max rate apps
Bravo & generics	chlorothalonil	M5	**Best**	Fail	Fail	none	1-3 pt	20 pts	6 (3 pt)
Penncozeb & generics	mancozeb	M3	Fail	Fail	M-G	none	2-3 lb	32 lbs	10 (3 lb)
Rovral & generics	iprodione	E3	M	Fail	Fail	none	1 pt (in tankmix) 1.5 pt (alone)	10 pts (in tank mix) 7.5 pts (alone)	10 (1 pt) 5 (1.5 pt)
Bravo 1.5 pt + Scala 9 fl oz	chlorothalonil pyrimethanil	M5 9	**Best**	M	Fail	none			6
Scala	pyrimethanil	9	M-P	M-P	Fail	none	9*-18 fl oz	54 fl oz	3 (18 fl oz)
Rovral 1 pt + Scala 9 fl oz	iprodione pyrimethanil	E3 9	VG	VG	Fail	none			6
Luna Tranquility	Fluopyram pyrimethanil	7 9	VG	**Best**	Fail	**No more than 2** sequential apps before rotating to non-7 or 9 group fungicides	16-27 fl oz	54.7 fl oz[4]	3 (16 fl oz)
Luna Experience	Fluopyram tebuconazole	7 3	??[5]	**Best?**[5]	Fail	**No more than 2** sequential apps before rotating to non-3 or 7 group fungicides	12.8 fl oz	25.6 fl oz[4]	2 (12.8 fl oz)
Merivon	fluxapyroxad + pyraclostrobin	7 11	VG	**Best**	M	**No more than 2** sequential apps before rotating to non-7 or 11 group fungicides	5.5-11 fl oz	33 fl oz 3 apps	3 (11 fl oz)
Quadris Top	azoxystrobin + difenoconazole	11 3	Fail	VG	M-G	**No more than 1** application before rotating to non-11 or 3 group fungicides	12-14 fl oz	56 fl oz[4]	4 (14 fl oz)
Inspire Super	difenoconazole + cyprodinil	3 9	M	VG	Fail	**No more than 2** sequential apps before rotating to non-3 or 9 group fungicides	16-20 fl oz	80 fl oz[4]	4 (20 fl oz)
Endura	boscolid	7	M	VG	Fail	**No more than 2** sequential apps before rotating to non-7 group fungicides	6.8 oz	41 oz 6 apps	6 (6.8 oz)

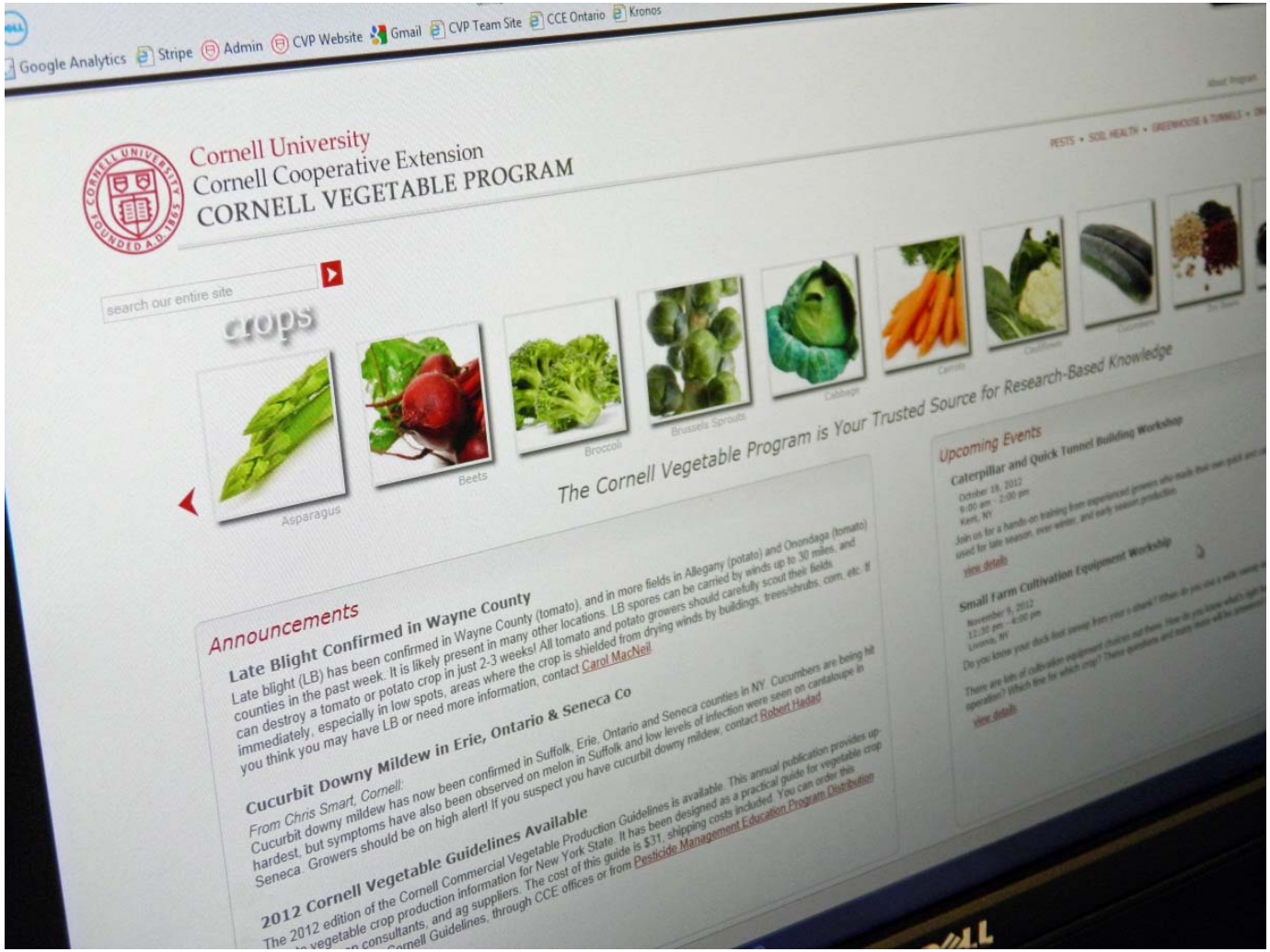
CCE Cornell Vegetable Program Website

- Onion section

Find Here:

Onion Fungicide Cheat Sheet

(Updated annually)



http://cvp.cce.cornell.edu/

Sample SLB Program #1 (Cadillac) ~ $380/A

+ $60 DM
= $440

38% FRAC 3; 75% FRAC 9 | **SLB (63% FRAC 7)**

Week 1	**Inspire Super 20 fl oz**	**3**	9	BLB*	DM**	**$10-25**
Week 2	**Luna Tranquility 16 fl oz**	**7**	9	BLB	DM**	**$10**
Week 3	**Merivon 9 fl oz**	**7**	11	BLB	DM	
Week 4	**Inspire Super 20 fl oz**	**3**	9	BLB*	DM**	**$10-25**
Week 5	**Luna Tranquility 16 fl oz**	**7**	9	BLB	DM**	**$10**
Week 6	**Merivon 9 fl oz**	**7**	11	BLB	DM	
Week 7	**Inspire Super 20 fl oz**	**3**	9	BLB*	DM**	**$10-25**
Week 8	**Luna Tranquility 16 fl oz**	**7**	9	BLB	DM**	**$10**

*Add Rovral 1 pt for BLB ($15)

BLB, DM:	protection	medicore	No control

**Add Mancozeb ($10) or FRAC 33 for DM

Is % of fungicide program belonging to FRAC 7 poor resistance management?

Sample SLB Program #2 (QT alt. LT) ~ $325/A

50% FRAC 3; 50% FRAC 9 **SLB (38% FRAC 7)** **+ $100 BLB/DM = $425**

Week 1	**Scala 9 fl oz + Rovral 1 pt**	**9**	2	BLB	DM**	$10
Week 2	**Quadris Top 14 fl oz**	**3**	11	BLB*	DM	$15
Week 3	**Luna Tranquility 16 fl oz**	**7**	9	BLB	DM**	$10
Week 4	**Quadris Top 14 fl oz**	**3**	11	BLB*	DM	$15
Week 5	**Luna Tranquility 16 fl oz**	**7**	9	BLB	DM**	$10
Week 6	**Quadris Top 14 fl oz**	**3**	11	BLB*	DM	$15
Week 7	**Luna Tranquility 16 fl oz**	**7**	9	BLB	DM**	$10
Week 8	**Quadris Top 14 fl oz**	**3**	11	BLB*	DM	$15

*Add Rovral 1.5 pt for BLB ($15)

BLB, DM:	protection	mediocre	No control

**Add Mancozeb ($10) or FRAC 33 for DM

Sample SLB Program #3 (IS x2 alt. Mer x2) ~ $375/A

	50% FRAC 3; 63% FRAC 9	SLB (50% FRAC 7)				+ $60 DM = $435
Week 1	**Inspire Super 20 fl oz**	**3**	9	BLB*	DM**	**$10-25**
Week 2	**Inspire Super 20 fl oz**	**3**	9	BLB*	DM**	**$10-25**
Week 3	**Merivon 9 fl oz**	**7**	11	BLB	DM	
Week 4	**Merivon 9 fl oz**	**7**	11	BLB	DM	
Week 5	**Inspire Super 20 fl oz**	**3**	9	BLB*	DM**	**$10-25**
Week 6	**Inspire Super 20 fl oz**	**3**	9	BLB*	DM**	**$10-25**
Week 7	**Merivon 9 fl oz**	**7**	11	BLB	DM	**$10-25**
Week 8	**Luna Tranquility 16 fl oz**	**7**	9	BLB	DM**	**$10**

*Add Rovral 1.5 pt for BLB ($15)

BLB, DM:	protection	Medicore	No control

**Add Mancozeb ($10) or FRAC 33 for DM

Is it better to rotate to a different product after 1 week or 2 weeks>?

Sample SLB Program #4 (Start Scala Rovral) ~ $345/A

	13% FRAC 3; 63% FRAC 9	SLB (37% FRAC 7)				+ $50 DM = $395
Week 1	**Scala 9 fl oz + Rovral 1 pt**	**9**	2	BLB	DM**	**$10**
Week 2	**Scala 9 fl oz + Rovral 1 pt**	**9**	2	BLB	DM**	**$10**
Week 3	**Scala 9 fl oz + Rovral 1 pt**	**9**	2	BLB	DM**	**$10**
Week 4	**Scala 9 fl oz + Rovral 1 pt**	**9**	2	BLB	DM**	**$10**
Week 5	**Merivon 9 fl oz**	**7**	11	BLB	DM	
Week 6	**Merivon 9 fl oz**	**7**	11	BLB	DM	
Week 7	**Inspire Super 16 fl oz**	**3**	9	BLB*	DM**	**$10-25**
Week 8	**Merivon 9 fl oz**	**7**	11	BLB	DM	

*Add Rovral 1.5 pt for BLB ($15)

BLB, DM:	protection	Medicore	No control

**Add Mancozeb ($10) or FRAC 33 for DM

SLB Resistant Management Questions

- FRAC 9 in Scala and Luna Tranquility (pyrimethanil) appears to be slipping. Is SLB developing resistance to it?
- If so, what is the risk of cross-resistance to FRAC 9 in Inspire Super (cyprodinil)?
- It is hard to avoid FRAC 9 when building fungicide programs:
  - Should its use be reduced?
  - If resistance exists, will it drag down efficacy of FRAC 7 & 3?
- What is the relative risk of the different FRAC groups for SLB to develop resistance?
  - 2, 3, 7, 9?
- If SLB has developed resistance to FRAC 7 Endura (boscalid), what is the risk of cross-resistance to FRAC 7 in Luna Tranquility (fluopyram) and Merivon (fluxapyrad)?
- Does it matter what my neighbor is spraying?