New Research for the Control of White Rot

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Overview

-INTRODUCTION TO WHITE ROT

-2011 FIELD EXPERIMENTS:
FUNGICIDES
DADS PLUS FUNGICIDES
DADS PLUS BIOLOGICALS

-DISCUSSION OF RESULTS

-ANALYSIS OF FUNGICIDE LEVELS IN SOIL AND TISSUE OVER TIME

Biology of White Rot of Onion and Garlic

- Caused by the soil fungal pathogen *Sclerotium cepivorum*



- White rot is a monocyclic disease. There is only one reproductive cycle per season.
- White rot overwinters and spreads as sclerotia, which are hardened spores.
- Sclerotia can remain viable in the soil for over 30 years, and are easily spread with equipment, wind, and water
- Sclerotia germinate in response to sulfur compounds which exude from Allium roots

Sclerotia Germination Stimulants

- Diallyl disulfide (DADS) (which mimics natural garlic and onion sulfur compounds) or garlic oil is sprayed on fallow fields and incorporated.
- The field can be planted with a non-host, but no onions or garlic can be planted for 1 year after application
- Sclerotia germinate, expecting host presence, and lacking a carbohydrate source, become exhausted and die.
- DADS, and other similar compounds can reduce sclerotia levels in the soil by 90-98%.

Fungicides Tested

Currently Labeled Fungicides

- **Folicur (tebuconazole): Group 3, DMI**
- **Cannonball (fludioxonil): Group 12, MAPHK osmotic signal transduction**
- **Endura (boscalid): Group 7, SDHI, complex II**

New Fungicides (not currently labeled)

- **Luna Privilege (fluopyram): Group 7, SDHI, complex II**
- **Fontelis (penthiopyrad): Group 7, SDHI, complex II**
- **Aproach (picoxystrobin): Group 11, Respiration**
- **Omega (fluazinam): Group 29, uncoupler of oxidative phosphorylation**

Field Experiments- Tulelake, CA

Fungicides for White rot Control

- In Spring 2011, a pre-emergent application was made at planting in a 4” bandwidth in the seed furrow
- A second application of some fungicides was applied as a broadcast treatment when the plants were at the two true leaf stage (two leaves after the flag leaf.)

Combining DADS with Fungicides

- DADS was broadcast sprayed in 2010 and incorporated at a rate of 1 gpa
- For the 2010 growing season, wheat was planted in the field
- The field was cultivated carefully to prevent soil movement between plots
- In Spring 2011, the field was planted and sprayed in the same manner as the fungicide only experiment

Processing onion Seed Variety: Sensient S32

Efficacy of Fungicides for White Rot Control

Fungicide	Rate of Application 1, at Planting	Rate of Application 2, at first leaf fall	Percentage of Diseased Bulbs	Avg. Diseased Yield/acre (tons)	Avg. Clean Yield/acre (tons)	Total Yield (tons)	Significance Grouping*
Folicur	20.5 fl oz/A	6 fl oz/A	39.9%	7.62	11.48	19.10	A
Folicur	20.5 fl oz/A		44.4%	6.87	8.60	15.46	AB
Fontelis	20 fl oz/A		47.6%	9.67	10.64	20.31	ABC
Fontelis	20 fl oz/A	20 fl oz/A	45.0%	7.95	9.73	17.68	ABC
Luna Privilege	6.84 fl oz/A		40.7%	6.36	9.28	15.64	ABC
Fontelis	16 fl oz/A		52.3%	9.83	8.95	18.78	ABC
Fontelis	24 fl oz/A		45.5%	7.35	8.81	16.16	ABCD
Cannonball	7 oz/A	7 oz/A	49.1%	8.17	8.47	16.63	ABCD
Omega	1.5 pt/A	1.5 pt/A	50.1%	8.45	8.40	16.85	ABCD
Cannonball	10 oz/A	10 oz/A	52.3%	9.17	8.38	17.55	ABCD
Aproach	12 fl oz/A		49.1%	7.95	8.24	16.19	ABCD
Omega	1.5 pt/A		52.1%	8.84	8.13	16.97	ABCD
Cannonball	10 oz/A		49.9%	7.73	7.77	15.50	BCD
Cannonball	7 oz/A		52.4%	7.95	7.24	15.19	DC
Aproach	12 fl oz/A	12 fl oz/A	51.4%	7.55	7.15	14.70	DC
Untreated			60.3%	7.93	5.21	13.14	D

*Treatments with the same letter are not significant from one another.

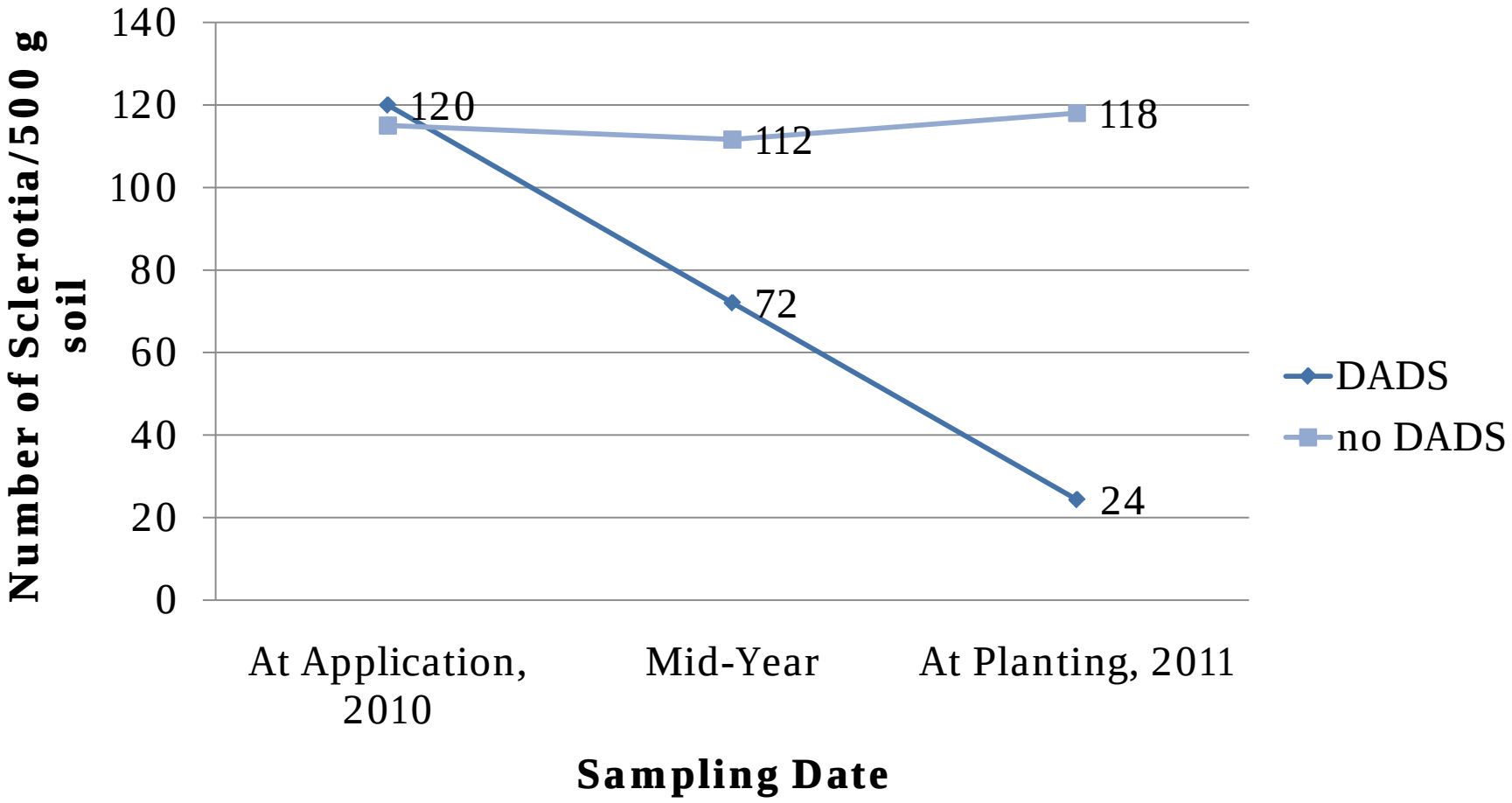
*Significance determined using the REGWQ test (similar to the Tukey test, but better controls Type II Error.)

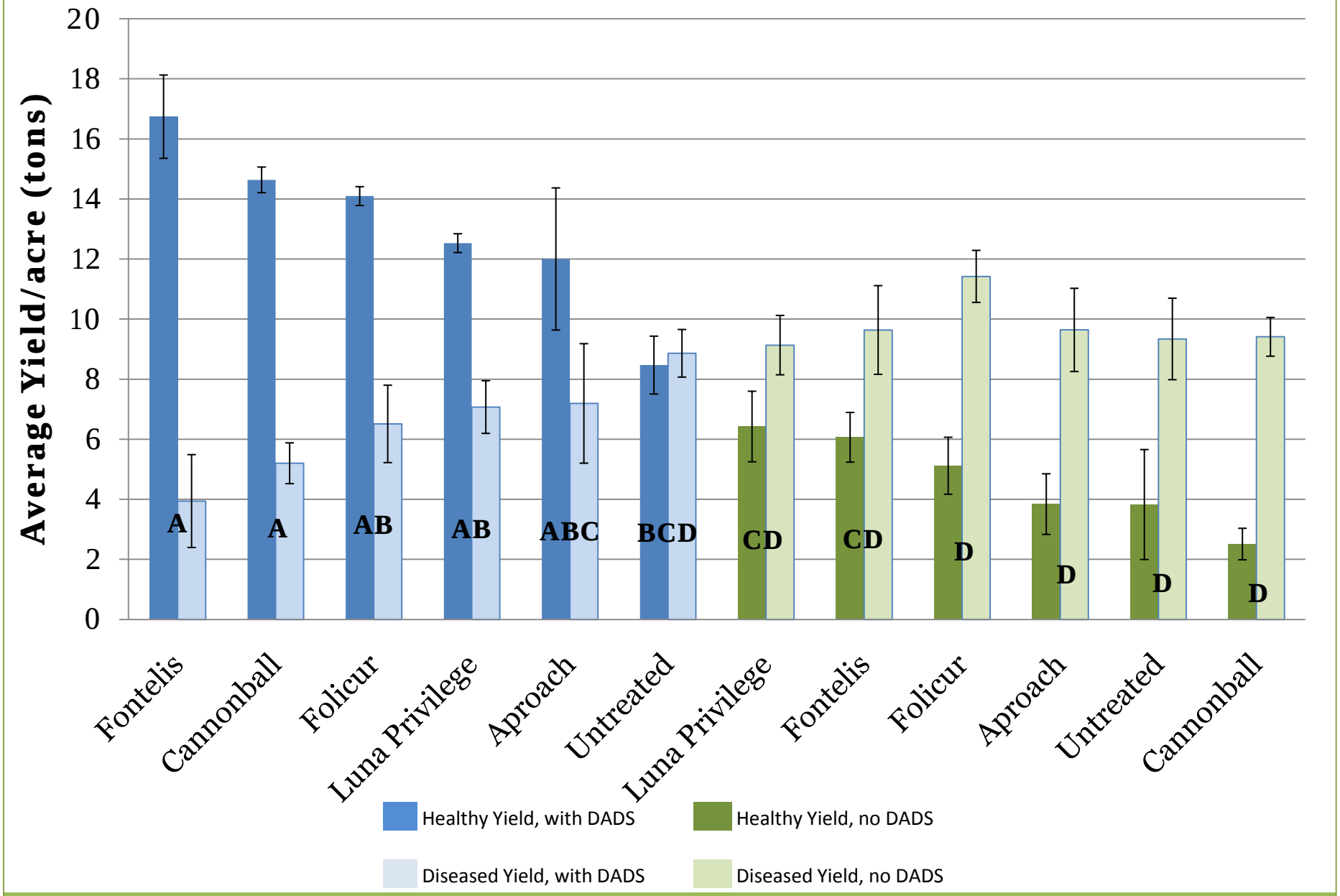
The Bottom Line…

- Applying higher than standard rates and/or multiple applications did not significantly increase healthy yields or reduce disease percentages.
- The most effective treatment for white rot is Folicur (20.5 fl oz/acre at planting.)
- Two new fungicides (not yet registered,) Luna Privilege and Fontelis, significantly reduce white rot incidence.
- Fungicides Omega and Aproach offer a control level similar to Cannonball, which is registered.

Efficacy of Combining DADS with Fungicides for White Rot Control

Effect of DADS on Sclerotia Numbers




Average Yield/acre (tons)
20
18
16
14
12
10
8
6
4
2
0
A
A
AB
AB
ABC
BCD
CD
CD
D
D
D
D
Fontelis
Cannonball
Folicur
Luna Privilege
Aproach
Untreated
Luna Privilege
Fontelis
Folicur
Aproach
Untreated
Cannonball
Healthy Yield, with DADS
Healthy Yield, no DADS
Diseased Yield, with DADS
Diseased Yield, no DADS

Effect of Combining DADS with Fungicides

DADS/no DADS	Fungicide	Disease Percentage	Average healthy yield/acre (tons)	Average diseased yield/acre (tons)	Total Yield/acre	Significance Grouping
DADS	Fontelis	19%	16.74	3.94	20.68	A
DADS	Cannonball	26%	14.64	5.20	19.84	A
DADS	Folicur	32%	14.10	6.51	20.61	AB
DADS	Luna Privilege	36%	12.53	7.07	19.60	AB
DADS	Aproach	37%	12.00	7.19	19.20	ABC
DADS	Untreated	51%	8.47	8.86	17.33	BCD
No DADS	Luna Privilege	59%	6.42	9.13	15.56	CD
No DADS	Fontelis	61%	6.07	9.64	15.70	CD
No DADS	Folicur	69%	5.12	11.42	16.54	D
No DADS	Aproach	72%	3.84	9.64	13.48	D
No DADS	Untreated	71%	3.83	9.34	13.17	D
No DADS	Cannonball	79%	2.51	9.41	11.92	D

Fungicide Only

DADS plus Fungicide

Fontelis

Fontelis

Folicur

Folicur

Biologicals in Combination with DADS

EXPERIMENT BY ROB WILSON, IREC, TULELAKE

Treatment Combinations

Trt #	Treatment Name	Product	Rate	Application Timing
1	Untreated Control (Farmore D300 Seed)			
2	Serenade Soil (Farmore D300 Seed)	Bacillus	4 qt/A	in furrow at planting
3	Compost + Compost Tea (untreated seed)	Compost	6 ton/A	Before Planting
		mycoapply	4 oz/A	in furrow at planting
		biolife	1 pt/A	in furrow at planting
		Serenade Soil	4 qt/A	in furrow at planting
		Compost Tea	15 gpa	in furrow at planting
		Compost Tea plus Fish	5 gpa 2 1/2 gpa	7 foliar sprays starting at emergence on 6/6, 6/14,/6/21, 7/5, 7/19, 7/27, & 8/10
A	Untreated Control			
B	DADS		1 gpa	

Trial Results

Average Across Biological Treatments	Onion Yield Clean ton/acre	Onion Yield w rot ton/acre	Onion Yield total ton/acre	Yield % with rot
All DADS Treatments (trts 1,2,&3)	8.33	8.06	16.4	50.26
All non-DADS treatments (trts 1,2, &3)	2.6092	7.47	10.085	73.45
Significantly Different (P-Value)	0.0265*	0.46 NS	0.0039*	0.063 NS

Average Across DADS and No-DADS Treatments

Trt #	Treatment Name	Onion Yield Clean ton/acre	Onion Yield w rot ton/acre	Onion Yield total ton/acre	Yield % with rot
1	Untreated Control	5.68	8.6	14.29	64.75
2	Serenade Soil	4.64	8.9	13.53	68.98
3	Compost + Compost Tea	6.08	5.82*	11.91	51.83*
	LSD=	NS	1.01	NS	7.33

Current Experiments

- Use of Mass Spectrometry to determine the concentration and movement of tebuconazole (Folicur) over time.
- Comparisons of Tulelake soil (high organic matter percentage,) soil with high clay content, and sandy loam soil
- Comparisons of fungicide levels in plant roots, bulbs and leaves
- This will give us a better idea of how tebuconazole “acts” in various soils, and how that correlates to the amount of disease in the field

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-Sensient

Questions

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