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2015 Progress Report- Combining Sclerotial Germination Stimulants and Fungicides for White Rot Management in Onions

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Introduction

Over the last several years experiments at IREC evaluated the efficacy and crop safety of fungicides and sclerotial germination stimulants for white rot control. The majority of the studies were conducted under the direction of Mike Davis (UC Davis Plant Pathologist). Studies showed fungicides and the sclerotial germination stimulant, DADS, can greatly reduce disease severity compared to the untreated control. Unfortunately, both control methods used individually failed to consistently reduce the incidence and severity of white rot symptoms low enough to ensure a profitable crop (less than 15% bulbs showing symptoms) especially in soil with high inoculum.

Recently, IREC researchers started testing a two-prong approach using germination stimulants to reduce soil inoculum density the year before growing onions and a fungicide applied in-furrow when growing the onion crop. The two-prong approach was quite effective at reducing white rot and it had an additive effect compared to using both controls individually. In 2012, only 12% of onion bulbs showed white rot symptoms when treated with DADS + tebuconazole compared to 78% of bulbs showing symptoms in the untreated. In 2013, 11% of the onion bulbs showed white rot symptoms when treated with DADS + tebuconazole compared to 80% in the untreated. The clean marketable yield in the DADS + tebuconazole treatment was greater than 24 tons/A both years. In 2014, the two-prong approach resulted in a clean onion yield over 25 tons/A and a diseased onion yield that was less than 15% of total onion yield.

This report summarizes a study conducted in 2014-2015 testing the two-prong approach. The primary study objectives were: 1.) Test the effectiveness of the two-prong approach in a field with a lower sclerotia population (14 sclerotia per 500g soil) compared to previous trials (>60 sclerotia per 500 g soil); and 2.) Determine if garlic juice at rates of 5, 10, and 20 gallons per acre applied as a sclerotial germination stimulant reduce the incidence and severity of white rot

when combined with fungicides. Fungicide treatments included tebuconazole and penthiopyrad (Fontelis).

2015 Trial Information

Location:	Tulelake, CA
Soil Type:	Tulebasin mucky silty clay loam; 6.46% organic matter
Onion Planting Date:	April 31st and May 1st 2015
Onion Harvest Date:	October 6th 2015
Irrigation:	Solid-set sprinklers
Plot Size:	Application size 12 ft (4 beds) by 30 ft, Harvest 6 ft (2 beds) by 30 ft
Bed (row) Spacing:	36 inches; 4 seed-lines per bed spaced 6 inches apart
Trt Replication:	5 replications
Seeding Rate:	28 seeds per bed foot

Sclerotial Germination Stimulant

DADs and garlic juice treatments were shank-injected in the soil at three depths using a chisel plow. Shanks were spaced 1 ft apart and injection points were 2.5, 7, and 11.5 inches deep. Treatments were applied 6/3/2014. Wheat was planted 3 days after application.

Fungicide Application Method

In-furrow treatments were applied using Teejet 8001 EVS nozzles @ 30 psi at onion planting. The nozzles were mounted on the onion planter to apply a 3 inch band directly over the seed line after seed placement but before furrow closure.

Onion Stand, Vigor, Leaf-Dieback Rating, and Yield

Onion stand density was measured in each plot by counting the number of green onions in all seed lines for the center two rows for the entire plot length. Onion vigor was visually estimated in each plot on June 9th, 25th and July 30th using a 0 to 10 scale, with 10 = highest vigor in the trial. Visual leaf die back ratings were taken on September 8th, 17th and 25th. Leaf die back was estimated using a 0 to 100% scale. Onion yield was measured by harvesting all onions in each plot. All onions were run across a grade-line to remove loose soil and then hand-sorted based on the presence of white-rot symptoms. A total weight was recorded for clean, disease-free onions and onions with white-rot symptoms (decay through 1st scale, mycelium, and sclerotia) in each plot.

Results

Onion stand and onion vigor were the same across treatments. In-season leaf dieback was minimal in all treatments including the untreated control presumably due to the low sclerotia population in the soil and abnormally high soil temperatures (> 70°F) during June, July, and early August which were not favorable for white rot development. White rot sclerotia populations in the soil were similar for DADs, all garlic juice treatments, and the untreated control during pre-treatment sampling and sampling at the time of onion planting (data not shown). Unlike previous testing, DADs failed to reduce sclerotia populations in the soil compared to the untreated control. The reason DADs did not reduce sclerotia populations may

be related to elevated soil temperatures in 2014. After sclerotial germination treatments were applied in 2014, soil temperatures were around 65°F for 14 days and then quickly climbed to over 70°F in late June and July.

Disease-free onion yield (clean yield) and diseased onion yield for all sclerotial germination stimulant and fungicide combinations are presented in Figure 1. Error bars on all graphs represent a 95% confidence interval. Total onion yield and disease-free onion yield did not differ between sclerotial germination stimulant treatments. Tebuconazole (Folicur) and penthiopyrad (Fontelis) lowered diseased onion yield and white rot severity on onion bulbs for all germination stimulant treatments (Figures 2 & 3).

Multiple years of data show the two-prong approach of combining DADS with the fungicide, tebuconazole, provides better suppression of white rot compared to DADS or fungicides applied alone. Unfortunately, results from this study did not support previous results as DADS and all garlic juice treatments did not reduce sclerotia populations compared to the untreated. Further testing under more favorable environmental conditions is needed to validate the efficacy of garlic juice as a sclerotial germination stimulant.

Fontelis and Folicur provided excellent suppression of white rot under 2015 conditions. Further testing in 2016 with garlic juice and other natural sclerotial germination stimulants will provide additional insight into the feasibility of using natural germination stimulants in place of DADs.

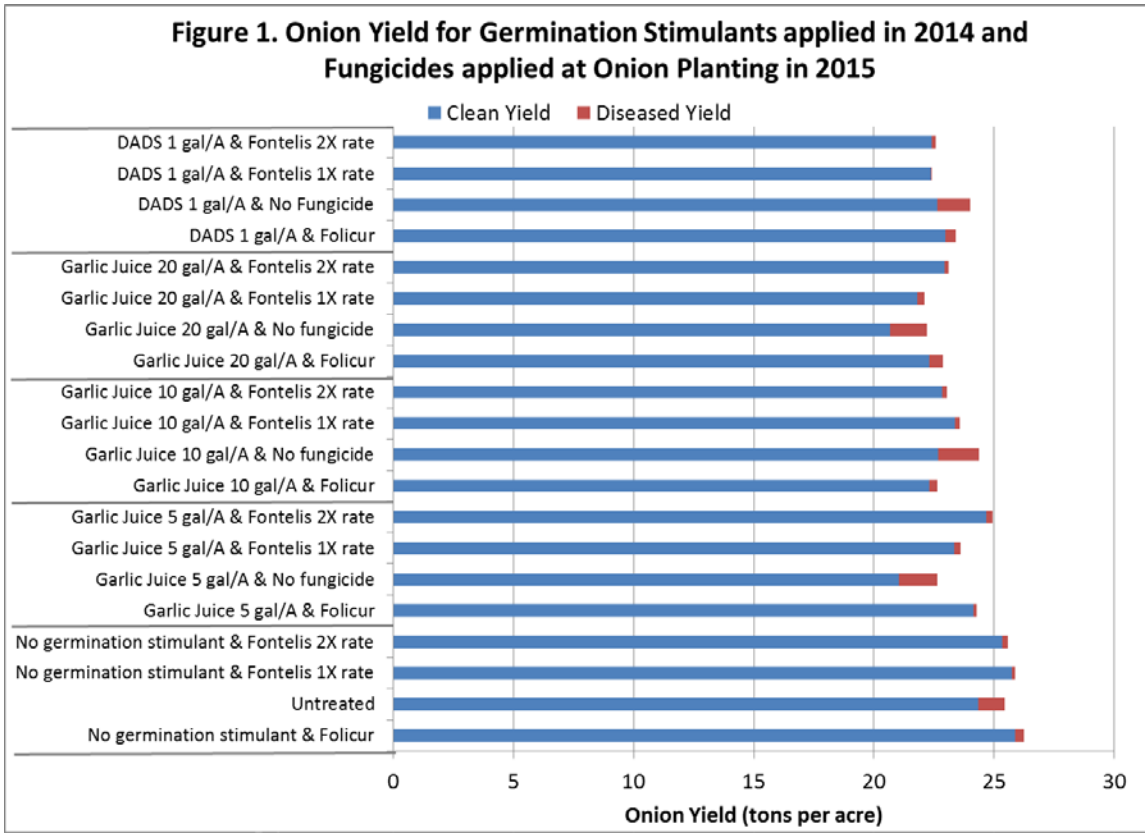

Figure 1. Onion Yield for Germination Stimulants applied in 2014 and Fungicides applied at Onion Planting in 2015

Figure 2. Onion Yield for Fungicides applied at planting in 2015 (averaged across germination stimulant treatments)

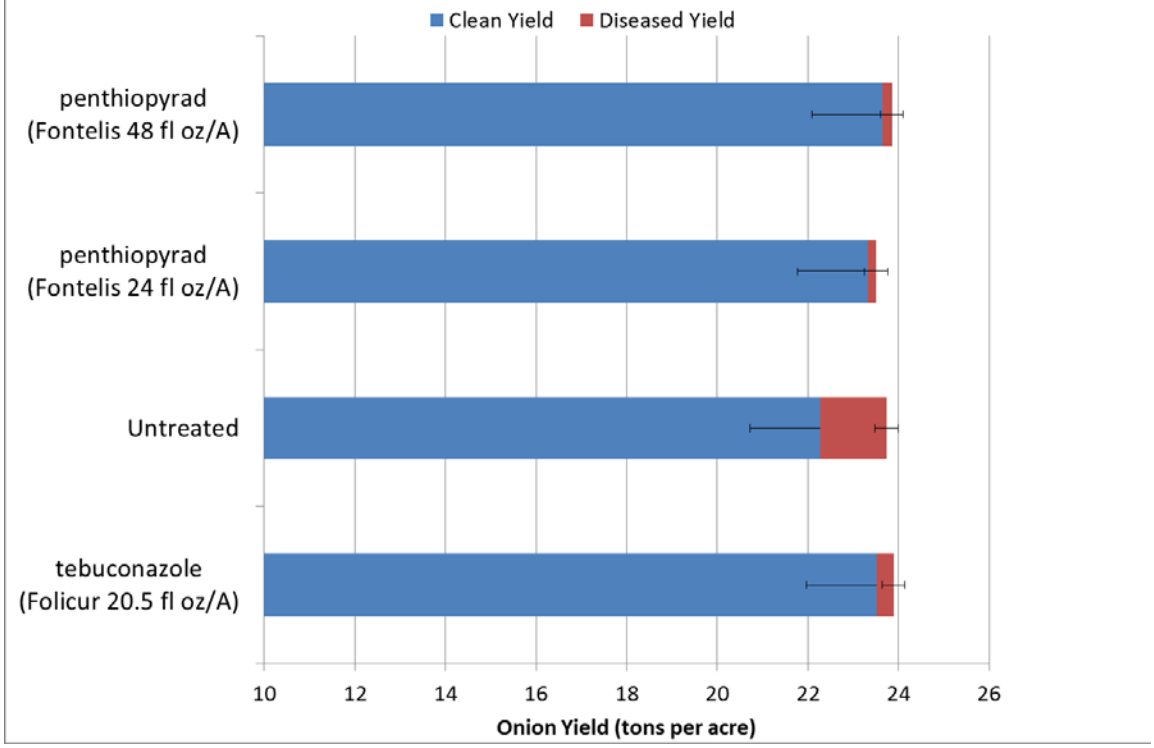

Figure 3. White Rot Severity on Onion Bulbs for 2015 Fungicides (averaged across germination stimulant treatments)