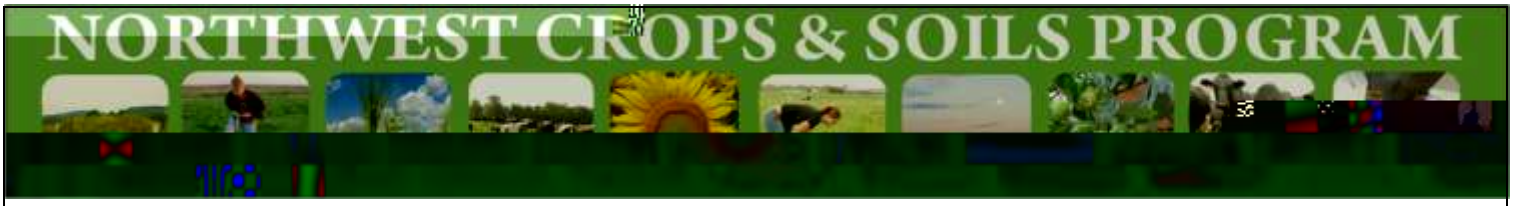

The Efficacy of Spraying Organic Fungicides to Control Fusarium Head Blight Infection in Spring Wheat

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THE EFFICACY OF SPRAYING ORGANIC FUNGICIDES TO CONTROL FUSARIUM HEAD BLIGHT

(28-Jun), plots not previously treated with a fungicide were sprayed with the fungicides treatments except for the control and *Fusarium graminearum* only plots (Table 2). Water was applied at the same rate as the fungicides to the control plots and to those that were only inoculated with *Fusarium graminearum.* Below is a list of the treatment materials evaluated in this trial. Descriptions have been provided from manufacturer information.

Location	Borderview Research Farm Alburgh, VT
Soil type	Benson rocky silt loam
Previous crop	Sunflowers
Row spacing (inch)	7
Seeding rate (live seed m^2)	350
Replicates	3
Varieties	Prosper and Glenn
Planting date	21-Apr
Harvest date	9-Aug
Harvest area (ft)	5 x 20
Tillage operations	Spring plow,

Actinovate® (EPA# 73314-1) is a biological fungicide (0.0371% Streptomyces lydicus WYEC 108) that suppresses and controls root rot, damping-off fungi and foliar fungal pathogens. Its active ingredient is a patented bacterium that grows around the root system (when soil drenched) and foliage of the plant (when sprayed on) while using several novel modes of antifungal action to protect plants.

ChampION++® (EPA# 55146 115) a fungicide/bactericide that controls key fungal and other diseases in a wide range of high-value crops. It is a new dry formulation (water dispersible granule) of copper that features consistently smaller particles and other unique formulation attributes to provide more thorough coverage – and thus better disease control –with less environmental loading.

Champ WG (EPA# 55146-1) is a 77% copper hydroxide-based, broad-spectrum fungicide for disease control. When copper hydroxide is mixed with water, it releases copper ions, which disrupt the cellular proteins of the fungus. This product is approved for use in organic production systems.

Regalia (EPA # 85059-3) bio fungicides have a unique and complex mode of action, referred to as Induced Systemic Resistance (ISR), and carry a FRAC code of P5. ISR creates a defense response in the treated plants and stimulates additional biochemical pathways that strengthen the plant structure and act against the pathogen. When applied to crops, Regalia products activate ISR and induce the plants to produce specialized proteins and other compounds—phytoalexins, cell strengtheners, antioxidants, phenolics, and PR proteins—which are known to inhibit fungal and bacterial diseases and also improve plant health and vigor. This product is approved for use in organic production systems.

varieties is real or whether it might have occurred due to other variations in the field. At the bottom of each table a LSD value is presented for each variable (e.g. yield). Least Significant Differences at the 10% level of probability are shown. Where the difference between two varieties within a column is equal to or greater than the LSD value at the bottom of the column, you can be sure in 9 out of 10 chances that there is a real difference between the two varieties. In the following example, variety A is significantly different from variety C, but not from variety B. The difference between A and B is equal to 725, which is less than the LSD value of 889. This means that these varieties did not differ in yield. The difference between A and C is equal to 1454, which is greater than the LSD value of 889. This means that the yields of these varieties were significantly different from one another. The asterisk indicates that variety B was not significantly lower than the top yielding variety.

RESULTS

Seasonal precipitation and temperature recorded at weather stations in close proximity to the 2016 site are shown in Table 3. The growing season this year was marked by lower than normal temperatures in April, and higher than average temperatures in May and August. Rainfall amounts were below average throughout the growing season resulting in 5.52 inches of precipitation less than normal. From April to August, there was an accumulation of 4536 Growing Degree Days (GDDs) which was 43.7 GDDs above the 30 year average.

Table 3. Temperature and precipitation summary for Alburgh, VT, 2016.

Alburgh, VT	April	May	June	July	August

There were no significant interactions between spring wheat variety and fungicide type and timing of application. This indicates that the varieties responded similarly to the fungicide treatments.

Impact of Fungicide and Timing

There was a significant difference in average FHB infected head severity between fungicide+timing treatments (Table 4). No significant differences were found in the average FHB plot severity and the incidence of infected heads between fungicide+timing treatments. Regalia applied at flowering had an average 14.5% FHB infected head severity and this was significantly higher than all other treatments.

Table 4. The FHB incidence and severity following fungicide treatments at flowering and five days after flowering, Alburgh, VT 2016.

Treatment	Average FHB severity	Average FHB infected head severity	Incidence FHB of

Inoculated Fusarium spores 24-Jun	14.4	58.6	2400	0.28
Actinovate – flowering	14.7	58.3	2622	0.48
Actinovate – 5 days after flowering	14.8	**58.8**	2570	**0.15**

Figure 1. The impact of application timing and fungicide on spring wheat yield.

Impact of Variety

There were no significant differences in the average FHB plot severity, FHB infected head severity, and incidence of FHB infection between spring wheat varieties (Table 6). Interestingly

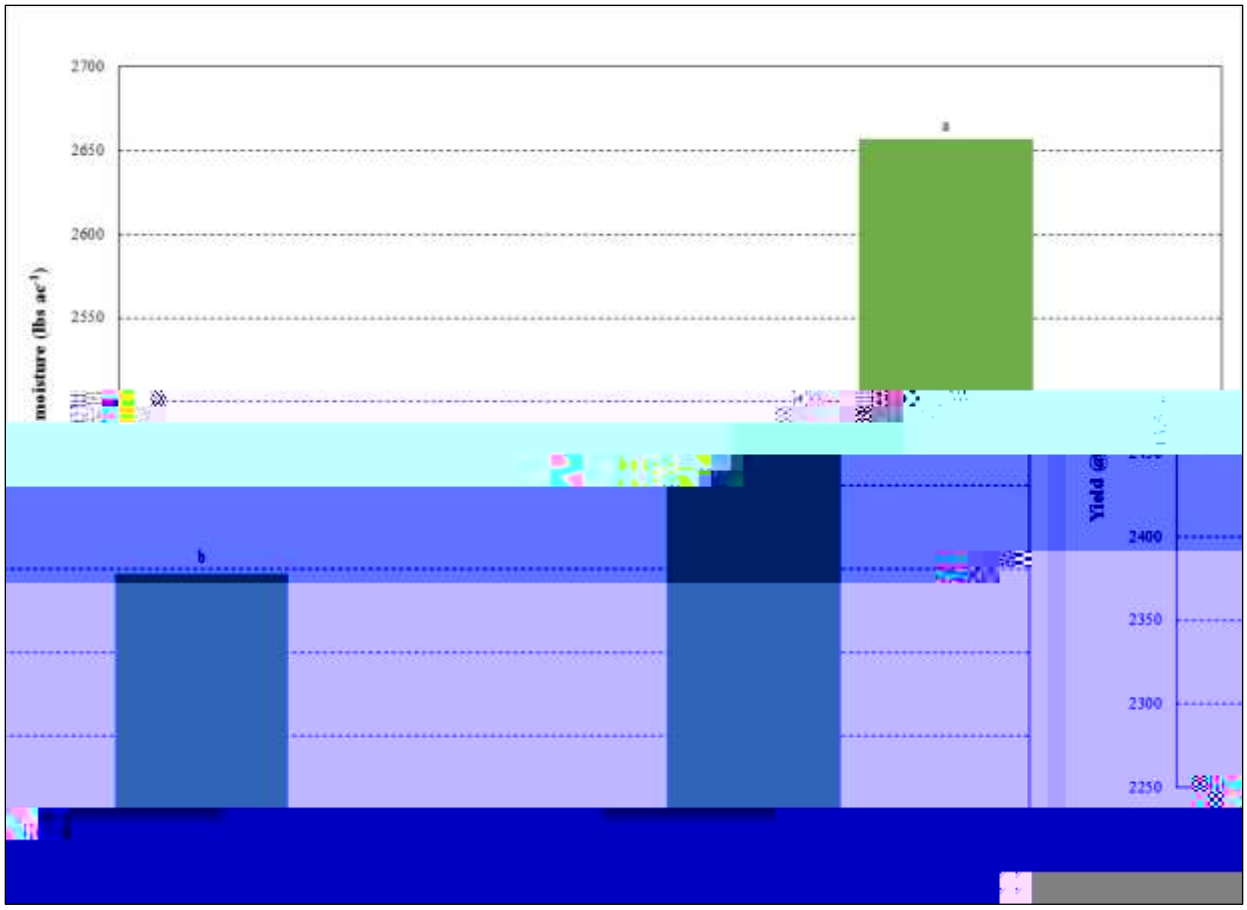

Figure 2. Impact of variety on spring wheat yields.

DISCUSSION

Overall, the 2016 growing season was ideal for growing spring wheat. The warmer than average temperatures, along with below normal rainfall throughout much of the growing season, resulted in minimal fungal growth. This is evident in the low DON concentrations in both varieties. All of the treatments, including the untreated control and the Fusarium only plots, had DON concentrations below the 1 ppm threshold. It is interesting, given the ideal growing conditions, that none of the treatments attained the industry standard for test weight. The lack of moisture during the growing season may have had an impact on grain fill.

It is important to remember that the results only represent one year of data. The Northwest Crops and Soils Program will be repeating this trial again in 2017.

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