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

THE EFFICACY OF SPRAYING FUNGICIDES TO CONTROL FUSARIUM HEAD BLIGHT INFECTION IN SPRING MALTING BARLEY

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The "localvore" movement and public interest in sourcing local foods has extended into beverages, and the demand for local brewing and distilling ingredients sourced in the Northeast remains high. One market that has generated interest from both farmers and end-users is malted barley. The Northeast is home to over 180 microbreweries and 37 craft distillers. Until recently, local malt was not readily available to brewers or distillers. The expanding malting industry provides farmers with new markets for grain crops. Regional maltsters continue to find it challenging to source enough local grain to match demand for their product. The local barley that is available does not always meet the strict quality standards for malting. One major obstacle for growers is *Fusarium* head blight (FHB) infection of grain. This fungal disease is currently the most significant disease facing organic and conventional grain growers in the Northeast, resulting in loss of yield, shriveled grain, and most importantly, mycotoxin contamination. A vomitoxin called deoxynivalenol (DON) is the primary mycotoxin associated with FHB. The fungus can overwinter in soils and spores can be transported by air currents. *Fusarium* can infect plants at spike emergence through grain fill. Consuming DON at over 1 ppm poses a health risk to both humans and livestock, and products with DON values greater than 1 ppm are considered unsuitable for human consumption by the FDA.

Fungicide applications have proven to be relatively effective at controlling FHB in other barley growing regions. Limited work has been done in this region on the optimum timing for a fungicide application to barley specifically to minimize DON. There are limited studies evaluating organic approved biofungicides, biochemicals, or biostimulants for management of this disease. In April 2020, the UVM Extension Northwest Crops and Soils Program initiated year six of a spring barley fungicide trial to determine the efficacy and timing of fungicide application to reduce FHB infection on cultivars with varying degrees of disease susceptibility.

Table 1. Trial agronomic information, 2020.

Fungicides trialed in the 2020 spring barley fungicide trial included Miravis Ace, Prosaro, Caramba, and ChampION (Tables 2 and 3). Miravis Ace was applied at Feekes stage 10.3 (when the grain head is half-emerged from the sheath), at heading (Feekes state 10.5), and at 4-6 days past heading. Prosaro and Caramba were applied at heading. ChampION was applied at heading, at 4-6 days post-heading, and one plot per replicate was treated both at heading and at five days post-heading. Treatments consisted of a combinat9(f434.9 710.64 >BDC q0.000009(nat)-5(9(f434.9 710.64 >BDC q0p0912 t(t)-4(e)on2 re12 o 792 rETQadi)ond a

Robust Heading Applications	17-Jun
Robust Inoculated with *Fusarium*	18-Jun
Robust Post-Heading Applications	23-Jun

On 10-Jul, w

Miravis® Ace (EPA# 100-1601) is a combination of propiconazole and Adepidyn®fungicide – the first SDHI mode of action available for *Fusarium* head blight control. It distributes evenly within the leaf and creates a reservoir within the wax layer of the leaf that withstands rain and degradation. It also provides protection against Septoria leaf spot and other foliar disease.

Prosaro® (EPA# 264-862) fungicide provides broad-spectrum disease control, stops the penetration of the fungus into the plant and the spread of infection within the plant and inhibits the reproduction and further growth of the fungus.

Data were analyzed using a general linear model procedure of SAS (SAS Institute, 2008). Replications were treated as random effects, and treatments were treated as fixed. Mean comparisons were made using the Least Significant Difference (LSD) procedure where the F-test was considered significant, at $p<0.10$. Variations in genetics, soil, weather, and other growing conditions can result in variations in yield and quality. Statistical analysis makes it possible to determine whether a difference between treatments is significant or whether it is due to natural variations in the plant or field. At the bottom of each table, a LSD value is presented for each variable (i.e. yield). Least Significant Differences (LSDs) at the 0.10 level of significance are shown. This means that when the difference between two treatments within a column is equal to or greater to the LSD value for the column, there is a real difference between the treatments 90% of the time. In the example to the right, treatment C was significantly different from treatment A, but not from treatment B. The difference between C and B is 1.5, which is less than the LSD value of 2.0 and so these treatments were not significantly different in yield. The difference between C and A is equal to 3.0, which is greater than the LSD value of 2.0. This means that the yields of these treatments were significantly different from one another. Treatment B was not significantly lower than the top yielding treatment, indicated in bold. A lack of significant difference is indicated by shared letters.

RESULTS

Seasonal precipitation and temperature recorded at a weather station at Borderview Research Farm are displayed below in Table 4. April and May were colder than normal, followed by a warm June, and a hot, recording-setting July. July was 4.17° F warmer than the norm. All months during the growing season had lower precipitation than the 30-year average, with 3.81 inches less over the four-month period than average. Through the four months of the growing season there was an accumulation of 3433 Growing Degree Days (GDDs), 55 GDDs above the 30-year norm.

Table 4. Temperature and precipitation summary for Alburgh, VT, 2020

Departure from normal	-0.72	-1.04	-1.77	-0.28
Growing Degree Days (32-95°F)	315	746	1046	1326
Departure from normal	-99	-13	35	132

Based on weather data from a Davis Instruments Vantage Pro2 with WeatherLink data logger.
Historical averages are for 30 years of data provided by the NOAA (1981-2010) for Burlington, VT.

Barleytage PnBT6

Miravis Ace (Heading) & Prosaro (Post)	14.50	45.1	3814	4.50
Caramba Heading	14.41	44.4	3314	4.46
ChampION Post-Heading	13.95	46.8	3746	4.53
ChampION Heading & Post-Heading	14.13	45.8	3946	4.54
ChampION Heading	13.96	45.3	3392	4.41
Inoculated *Fusarium* spores	14.40	46.2	3656	[redacted]

Figure 1. The impact of application timing and fungicide on bT3ngicide wleyuFigure

although both were well below the FDA threshold of 1 ppm. FHB severity and incidences were similar between the two varieties.

Figure 2

This trial is expected to continue for additional years. It is important to remember that the results only represent one year of data. Ideally, this trial should be repeated in a year with wet and cool weather conditions favorable to fungal diseases.

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