BARLEY (*Hordeum vulgare* 'Quest', 'Lacey', 'AAC Synergy', 'Newdale')
Fusarium head blight (scab); *Fusarium graminearum*
Spot blotch; *Bipolaris sorokiniana*
Powdery mildew; *Blumeria graminis* f. sp. *hordei*

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Evaluation of integrated methods for management of Fusarium head blight and foliar diseases of spring malting barley in New York, 2015.

The trial was conducted at the Musgrave Research Farm in Aurora, NY in a Lima silt loam soil planted with four spring malting barley varieties, 'Quest' (6-row), 'Lacey' (6-row), 'AAC Synergy' (2-row), and 'Newdale' (2-row), on 1 May. The experiment was set up as a completely randomized block design with a split-plot arrangement, with cultivar as the main plot and the fungicide treatments as subplots, randomized in four replicated blocks. Main plots were sown at 100 lb/A with a commercial grain no-till drill into wheat stubble. Subplots were 20 × 10 ft including 15 rows with 7.5-in. row spacing. The plots were fertilized at planting (200 lb/A of 10-20-20) and topdressed on 21 May (60 lb/A of urea, providing an additional 27.6 lb/A of nitrogen). The 6-row type barley heads emerged earlier than the 2-row type barleys, and therefore the fungicide applications were split between the two different timings of head emergence for the two barley types. Fungicides were applied to Quest and Lacey plots at head emergence (Feekes growth stage, FGS 10.5) on 26 Jun, and to AAC Synergy and Newdale plots on 29 Jun. Fungicide applications included the surfactant Induce at 0.125% v/v. After the fungicides had dried, plots were spray-inoculated with a conidial suspension of *F. graminearum* (40,000 conidia/ml) to augment the development of FHB. Fungicide and *F. graminearum* treatments were applied with a tractor-mounted sprayer with paired TJ-60 8003vs nozzles mounted at an angle (30° from horizontal) forward and backward, 20-in. apart, pressurized at 30 psi, and calibrated to deliver 20 gal/A. Incidence and severity (percent of symptomatic spikelets on symptomatic heads) of FHB in each plot were rated on 2 Jul and used to calculate FHB Index, where FHB index = (FHB severity * FHB incidence)/100. Spot blotch (*Bipolaris sorokiniana*) and powdery mildew (*Blumeria graminis* f. sp. *hordei*) were rated on 2 Jul as percent severity on flag leaves (average rating for whole plot). Grain was harvested from a 20 × 5 ft area in each subplot using an Almaco plot combine on 31 Jul. Grain moistures, plot yields, and test weights were recorded. Yield and test weights were adjusted to bu/A at 14.5% moisture. Analysis of deoxynivalenol (DON) content in grain was conducted in the US Wheat and Barley Scab Initiative-supported mycotoxin analysis laboratory at the University of Minnesota, St. Paul, MN. Treatment means were calculated, subjected to analysis of variance, and separated by Fisher's protected LSD test ($P = 0.05$).

Based on observations of surrounding non-inoculated barley in the same field, FHB and DON development in 2015 were attributed primarily to supplemental rather than background inoculum. Because differences in head emergence timings, the 2-row and 6-row types were sprayed and inoculated on different dates, and were thus analyzed separately to rule out possible effects of differences in microenvironment at application timings. The incidence of visible FHB over all plots ranged from 4 to 10%. Under moderately low disease pressure, no significant differences were detected in spot blotch, FHB, DON or yield among 2-row varieties, but AAC synergy had significantly higher powdery mildew than Newdale. The 6-row varieties, however, under similarly low disease pressure did show significant differences for powdery mildew, FHB and DON, with Lacey being consistently greater for each. And, Lacey was the only variety to have DON concentrations greater than the 1 ppm threshold set by malthouses, regardless of treatment, with DON reaching 3.9 ppm in non-treated plots. This indicates that Lacey is more susceptible to FHB and powdery mildew than the other varieties evaluated in this trial. When results of cultivars were combined, the treatments showed no effect on any disease variable or yield for the 2-row types. The results were similar for the 6-row types with the exception that the non-treated plots had significantly greater powdery mildew than either fungicide treatment. When analyzed individually by variety, application of Prosaro or Caramba at the recommended timing only significantly reduced powdery mildew and DON for Lacey, but had no significant effect on foliar diseases, FHB or DON for any other variety. No significant differences were detected for yield among treatments, barley types, or varieties. This may have been due to severe flooding of the trial in early June which resulted in random wash-outs and uneven emergence and stands throughout the trial. Overall, the results of this trial indicate that the application of recommended fungicides at head emergence on these four malting barley varieties only resulted in a significant DON reduction for the most susceptible of the varieties evaluated.

Cultivar, treatment, and rate/A	Leaf blotch (%)[x]	Powdery mildew (%)	FHB incidence (%)	FHB index	DON (ppm)	Yield (bu/A)
Quest						
Non-sprayed, inoculated control	4.8	26.5	3.0	0.1	1.0 a	28.3
Prosaro SC (6.5 fl oz) and inoculated FGS 10.5	6.3	15.8	1.5	0.0	0.5 b	42.8
Caramba (13.5 fl oz) and inoculated FGS 10.5	8.8	13.8	3.5	0.1	0.6 b	42.3
LSD (*P*=0.05)	NS	NS	NS	NS	0.35	NS
CV (%)	75.7	54.3	58.4	58.4	47.6	32.1
Lacey						
Non-sprayed, inoculated control	4.5	46.3 a	4.0	0.1	3.9 a	48.7
Prosaro SC (6.5 fl oz) and inoculated FGS 10.5	5.0	25.0 b	4.5	0.1	1.6 b	41.4
Caramba (13.5 fl oz) and inoculated FGS 10.5	5.5	24.5 b	5.5	0.2	1.8 b	43.7
LSD (*P*=0.05)	NS	17.91	NS	NS	0.87	NS
CV (%)	43.5	45.6	46.0	46.0	54.8	33.4
AAC Synergy						
Non-sprayed, inoculated control	2.0	1.1	2.5	0.1	1.1	39.4
Prosaro SC (6.5 fl oz) and inoculated FGS 10.5	1.5	0.6	3.0	0.0	0.7	55.1
Caramba (13.5 fl oz) and inoculated FGS 10.5	2.0	1.1	4.5	0.1	0.9	35.6
LSD (*P*=0.05)	NS	NS	NS	NS	NS	NS
CV (%)	49.8	81.6	73.9	87.9	34.8	47.3
Newdale						
Non-sprayed, inoculated control	0.8	0.6	0.5	0.01	0.5	26.0
Prosaro SC (6.5 fl oz) and inoculated FGS 10.5	0.5	1.0	2.0	0.02	0.8	39.1
Caramba (13.5 fl oz) and inoculated FGS 10.5	0.9	1.0	2.5	0.03	0.6	36.4
LSD (*P*=0.05)	NS	NS	NS	NS	NS	NS
CV (%)	36.4	65.0	133.8	133.8	41.9	43.6
Cultivar mean (6-row)						
Quest	6.6	18.7 b	2.7 b	0.08 b	0.7 b	37.8
Lacey	5.0	31.9 a	4.7 a	0.14 a	2.4 a	44.6
LSD (*P*=0.05)	NS	10.61	1.57	0.047	0.85	NS
CV (%)	66.4	55.4	57.3	57.3	84.0	33.3
Cultivar mean (2-row)						
AAC Synergy	1.8 a	1.0	3.3	0.04	0.9	43.4
Newdale	0.7 b	0.9	1.7	0.02	0.7	33.8
LSD (*P*=0.05)	0.61	NS	NS	NS	NS	NS
CV (%)	68.6	73.1	98.0	110.0	40.2	47.0
Treatment mean (6-row)						
Non-sprayed, inoculated control	4.6	36.4 a	3.5	0.1	2.5	38.5
Prosaro SC (6.5 fl oz) and inoculated FGS 10.5	5.6	20.4 b	3.0	0.1	1.0	42.1
Caramba (13.5 fl oz) and inoculated FGS 10.5	7.1	19.1 b	4.5	0.1	1.2	43.0
LSD (*P*=0.05)	NS	12.08	NS	NS	NS	NS
CV (%)	66.4	55.4	57.3	57.3	84.0	33.3
Treatment mean (2-row)						
Non-sprayed, inoculated control	1.4	0.9	1.5	0.03	0.8	32.7
Prosaro SC (6.5 fl oz) and inoculated FGS 10.5	1.0	0.8	2.5	0.03	0.7	47.1
Caramba (13.5 fl oz) and inoculated FGS 10.5	1.4	1.1	3.5	0.04	0.8	36.0
LSD (*P*=0.05)	NS	NS	NS	NS	NS	NS
CV (%)	68.6	73.1	98.0	110.0	40.2	47.0

[x] Column numbers followed by different letters are significantly different at *P*=0.05 as determined by Fisher's protected LSD