

Evaluation of resistant cultivars for management of downy mildew in fall cucumbers, 2020

In the last 15 years, late-summer and fall cucumbers have become increasingly rare—long gone are the days when you could reliably harvest cucumbers until the frost. This is largely due to cucurbit downy mildew, a disease that overwinters in the southern US and is blown northward on storm fronts annually, arriving around mid-August and effectively ending the cucumber season. Previously, cucurbit downy mildew was not a concern for MA growers because all cucumber varieties were bred to have resistance to the disease. However in 2004, the pathogen evolved and overcame that resistance, and breeders have been working hard to develop new resistant varieties ever since.

For the past 5 years, the UMass Extension Vegetable Program has worked with the NEVBGA and Johnny's Selected Seeds to conduct cucumber variety trials to evaluate varieties' susceptibility to cucurbit downy mildew (DM). Over the years, these trials have helped to identify DM-resistant cucumber varieties appropriate for New England markets, including Bristol, DMR401, NYS264, and Citadel. Results from our 2016-17 trials are available in the [March 15, 2018 issue of Vegetable Notes](#).

In our 2020 trial, we evaluated 8 cucumber varieties—7 slicers and 1 pickler—with 4 replications of each variety organized in randomized complete blocks. See Table 1 for a full list of varieties. We planted three-week old seedlings into raised beds with black plastic mulch, with 1 line of drip irrigation per bed. Each plot was made up of 6 plants, 18 inches apart in-row, with 10 feet of unplanted bed between plots. We then measured downy mildew severity in each plot weekly, and total and marketable yield twice a week. Cucumbers were deemed “unmarketable” if they were misshapen or had significant insect damage (most commonly, striped cucumber beetle damage).

Despite the drought conditions in 2020, DM arrived relatively early in our trial, on July 24. Normally in these trials, we also evaluate the varieties for powdery mildew resistance, but powdery mildew didn't develop in our trial at all in 2020 since all the varieties tested had resistance to that disease as well. DM appeared first on the variety TSX CU201AS, followed by Marketmore 76 and Green 18 the following week. Plant pathologists commonly compare disease incidence over time using a single value, called the Area Under the Disease Progress Curve, or AUDPC. A higher AUDPC value means more disease over time, and a lower AUDPC means less disease over time.

- Marketmore 76 and Green 18 had significantly higher AUDPC levels than all other varieties in this trial, showing that they had lower resistance to the disease.
- TRI-CU234AS and TRI-CU236AS had the lowest AUDPC of all varieties in this trial, and CU231AS had a slightly numerically higher but not significantly different AUDPC. This means that these 3 varieties performed equally well and had the lowest downy mildew incidence over time.
- Espirit, the only pickling variety in this trial, had the highest marketable yield in this trial. Of the slicing varieties, TSX CU201, TSX CU234, Raceway, and Marketmore 76 produced the highest marketable yields, despite Marketmore 76 having one of the highest AUDPCs. Marketmore 76 having high downy mildew incidence but producing one of the highest marketable yields has been a trend over the last few years of these trials.
- Of the slicing varieties, TRI-CU234 performed consistently well in regards to marketable yield and disease resistance.

- TSX CU201AS and CU231AS were also evaluated in the 2019 trial. In 2019, TSX CU201AS was the overall best-performing variety, with high marketable weight and low downy and powdery mildew incidence, and CU231AS had low disease incidence but low marketable yield. In 2020, TRI-CU234AS performed better than both TSX CU201AS and CU231AS.

Table 1 presents the data from this trial. Again, AUDPC represents the disease incidence over time—a higher AUDPC means more disease. Values that are followed by the same letter are not significantly different from each other. For example, the marketable weight for Green 18 is not significantly different from the those of CU231AS *or* TRI-CU236AS, and the marketable weight of TRI-CU236AS is also not significantly different from that of Raceway or Marketmore 76.

Table 1. Yield and area under the disease progress curve for DM.					
	Vendor	AUDPC ^z	Total weight ^x	Marketable weight	Marketable:Total Yield Ratio
Raceway	Seminis	1141.9 c	78.5 a	39.6 bc	0.5
Marketmore 76	Hollar	2289.0 e	51.8 bc	39.3 bc	0.76
Green 18	Genesis	2398.4 e	44.2 c	21.3 a	0.48
TSX CU201AS	Tokita	1628.4 d	61.2 abc	42.8 c	0.70
CU231AS	Tokita	441.9 ab	60.5 abc	21.9 a	0.36
TRI-CU234AS	Tokita	371.9 a	74.8 a	43.0 c	0.58
TRI-CU236AS	Tokita	275.6 a	65.8 ab	29.4 ab	0.45
Espirit	Seminis	805.0 bc	71.7 a	62.1 d	0.87
p-value		<0.0001	0.0241	<0.0001	
^z Area under the disease progress curve was calculated from 31 Jul to 31 Aug for delicate and 07 Sep for butternut according to the formula : $\sum_{i=1}^n [(R_{i+1} + R_i)/2] [t_{i+1} - t_i]$, where R = disease severity rating (% of leaf surface affected) at the <i>i</i> th observation, <i>t_i</i> = time (days) since the previous rating at the <i>i</i> th observation, and n = total number of observations. Values were calculated based on the average percent disease severity across the plot. ^y Data were analyzed using PROC GLM and means were separated using Fisher's LSD. Numbers within each column followed by the same letter are not significantly different from each other. ^x Total and marketable yields from each plot were recorded twice weekly and are here summed across the whole season.					



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