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Basil Variety Trial Report

Rebecca Brown

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2019 URI BASIL VARIETY TRIAL

Dr. Rebecca Nelson Brown



INTRODUCTION

Over the past decade basil downy mildew, caused by the oomycete *Peronospora belbahrii*, has become the primary limiting factor for basil production in New England. The pathogen attacks the leaves, resulting in chlorotic patches on the upper surface and purplish-brown spore masses on the underside. Infected leaves are unmarketable. Basil downy mildew is an obligate parasite, requiring living tissue to survive. It does not overwinter in New England, and may not become widespread in the region until late in the summer. However, basil downy mildew can also be introduced in infected seedlings, which develop obvious symptoms with the first hot, humid days of summer. Spores are transported on the wind, and once sporulation begins the disease spreads quickly. Basil downy mildew can be controlled by rigorous application of effective synthetic fungicides beginning before the disease is present, but the need to treat every seven to ten days, to rotate among fungicides with different modes of activity, and to obtain thorough coverage of leaves make disease management with fungicides expensive.

In 2018 several new varieties of Genovese-type basil were introduced with high levels of resistance to basil downy mildew. These varieties have the potential to be game-changing for growers who prefer not to use synthetic fungicides, or do not have the resources to maintain a rigorous spray program. However, the unpredictable arrival of basil downy mildew each year means that for best results the resistant varieties should yield comparably to the best susceptible varieties in the absence of basil downy mildew. The objective of the 2019 basil variety trial was to compare the new resistant varieties with the current tolerant varieties and the susceptible yield standard 'Nufar'.

MATERIALS AND METHODS

The variety trial included nine entries, listed in Table 1. Seed of all entries was started in the greenhouse on May 8 using 50-cell plug trays filled with conventional soilless mix. Seedlings were thinned to one per plug two weeks after seeding. Transplants were moved to an outdoor shade structure on June 1, and were transplanted into the field June 5-8.

The trial was designed as two separate plantings, located 1,000 feet apart at the Gardiner Crops Research Center at URI. Each planting had four replications, with 20 plants per plot. Basil was planted into plastic-covered raised beds with 2 rows per bed. Plants were spaced 12 inches apart both within and between rows in the bed, and beds were 5 feet apart on center. Water and fertilizer were supplied through drip tape under the plastic. All plants were pinched June 26 to encourage branching.

One planting was managed to promote yield and delay development of downy mildew. This planting was fertilized weekly, and was sprayed with Regalia fungicide on June 26, Quadris fungicide on July 19th, Revus on July 25th, Quadris on

Variety	Source
Emma	Osborne Seeds
Prospera	Johnny's Selected Seeds
Everleaf	Johnny's Selected Seeds
Eleonora	Johnny's Selected Seeds
Devotion	VDF Specialty Seeds
Obsession	VDF Specialty Seeds
Thunderstruck	VDF Specialty Seeds
Passion	VDF Specialty Seeds
Nufar	Johnny's Selected Seeds

Table 1. Variety names and suppliers for the basil trial entries. The entries supplied by VDF Specialty Seeds were bred by James Simon and Andy Wyenandt at Rutgers University, and are available from multiple seed companies. 'Everleaf' and 'Obsession' are compact varieties, while 'Thunderstruck' has slightly ruffled leaves. All others are standard Genovese types.

August 7th and Phiticide on August 14th. Basil was harvested July 16th and August 12th, and was rated for downy mildew severity on August 8th. Plant height was measured July 15th and flowering was noted on July 15th and September 6th. One plant from each plot was separated into stems and leaves, dried, and weighed to calculate the leaf yield as a percentage of total biomass. The other planting was managed to promote development of basil downy mildew. Highly susceptible ‘Italian Large Leaf’ basil plants were planted at the ends of the beds and between plots to serve as spreader plants, and the trial was covered with spun-bonded rowcover to increase humidity. No fungicides were applied. This planting was harvested on July 16th. Downy mildew was observed in the susceptible spreader plants on July 25th, and disease severity was rated on August 8th, August 20th and September 6th.

RESULTS

DOWNY MILDEW RESPONSE

The five resistant varieties remained free of sporulating downy mildew for the entire trial period, even without fungicides (Figure 1). ‘Devotion’ and ‘Passion’ developed noticeable chlorosis, particularly on older leaves, but most foliage remained marketable. ‘Prospera’, ‘Thunderstruck’, and ‘Obsession’ remained completely clean, with no foliar damage. In contrast, ‘Nufar’ developed extensive sporulation, chlorosis, necrosis and defoliation, even in the planting where fungicides were used. Regular application of fungicides kept disease severity of the tolerant varieties ‘Eleonora’, ‘Emma’ and ‘Everleaf’ significantly below that of ‘Nufar’. However, only the youngest fully expanded leaves on each shoot remained marketable, lowering yields and greatly increasing time required for harvesting. Without fungicides disease developed more slowly in the tolerant varieties than in ‘Nufar’, but the difference was not enough to usefully extend the harvest period.

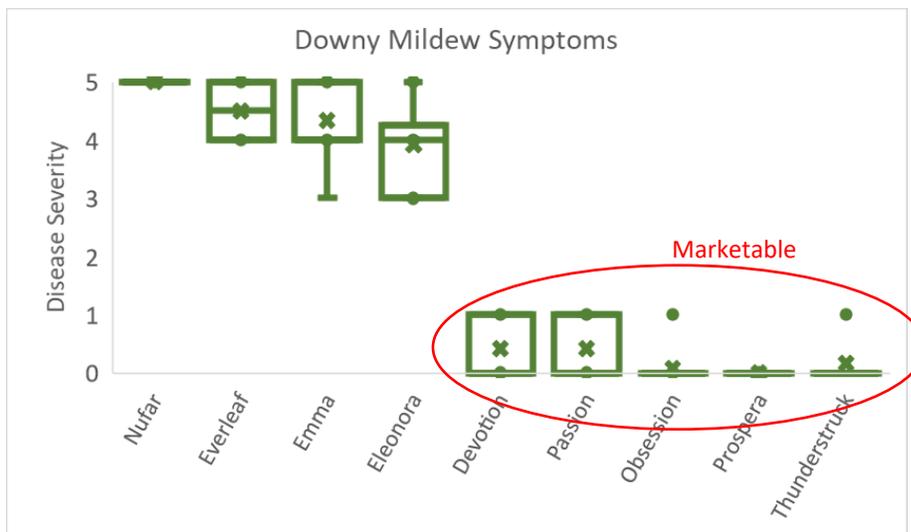


Figure 1. Severity of Downy Mildew symptoms on nine basil varieties grown without fungicides. Disease severity was rated on a scale from 0 to 5 with 0 indicating no disease. A score of 5 indicates no marketable foliage, while a score of 3 indicates that the youngest fully expanded leaves remained marketable.



Figure 2. A resistant variety in the no-fungicide planting on August 20.

YIELDS

Both plantings were harvested on July 16 when the earliest-flowering varieties were fully budded and before downy mildew was present in the no-fungicide planting. 'Passion' had the highest yield in the planting managed for yields, averaging 7.6 pounds of basil from 20 plants (figure 3). 'Nufar' ranked second at 7.3 pounds; the difference was not statistically significant. 'Obsession', 'Everleaf', and 'Thunderstruck' yielded significantly less than 'Passion' and 'Nufar'. Yields were significantly lower in the planting managed to promote disease, and there were no significant differences among varieties. However, the rank order of the varieties was the same as for the trial managed for yields. These results suggest that 'Prospera', 'Passion' and 'Devotion' will give satisfactory yields even in the absence of basil downy mildew.

The planting managed for yield was harvested a second time on August 12th when the earliest-flowering varieties were again fully budded. 'Nufar' was severely infected with downy mildew despite the fungicide program. 'Passion' again had the highest yield, averaging 10.6 pounds of basil from 20 plants (figure 3). The other resistant varieties were statistically similar to 'Passion'. 'Emma' yielded the most of the tolerant varieties at 4.9 pounds, followed by 'Eleonora' at 2.4 pounds. 'Everleaf' and 'Nufar' yielded the least, and would not have been worth harvesting for commercial production. Resistant variety yields were higher in the second harvest than in the first because plants were larger.

Some markets prefer basil sold as clamshell boxes or bags of leaves, without the stems. 'Everleaf' had the least stem, with 81% leaves. 'Prospera' was the stemmiest with only 67% leaves. When varieties are compared for leaf yield, rather than total yield, 'Nufar', 'Passion' and 'Devotion' had the highest yields on July 16 but 'Prospera' had significantly lower yields (Figure 4). Among the downy mildew resistant varieties 'Thunderstruck' yielded significantly less than the others, and 'Prospera' and 'Obsession' yielded significantly less than 'Passion'.

GROWTH HABIT AND FLOWERING

Plant height was measured on July 15, and plants were evaluated for flowering on July 15 and September 6. Data are shown in Table 2. The September 6 evaluation was done on plants which had been growing unharvested since July 17. 'Eleonora' and 'Emma' were the first varieties to flower, and had open flowers on July 15. In contrast, 'Everleaf' and 'Obsession' had not developed visible buds. On September 6 'Everleaf' and 'Obsession' had buds but not open flowers. 'Everleaf' had the shortest plants, while 'Prospera' had the tallest.

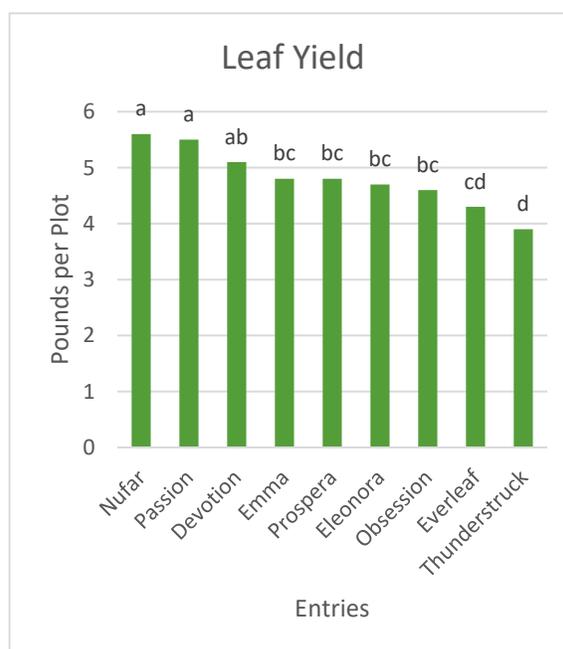


Figure 4. Basil yields from the July 16 harvest, adjusted by percent leaf. Bars with the same letter do not differ significantly at $\alpha = 0.05$.

Entry	Height (cm)	Flower Development	
		July 15	Sept. 6
Devotion	40.75	full bud	full bloom
Eleonora	45.9	first flowers	seed set
Emma	45.9	first flowers	full bloom
Everleaf	24.4	no buds	full bud
Nufar	42.0	small buds	first flowers
Obsession	34.4	no buds	full bud
Passion	41.2	full bud	first flowers
Prospera	54.7	full bud	full bloom
Thunderstruck	41.0	small buds	full bloom

Table 2. Basil canopy height and flower development stage. A height difference of 4.2 cm was statistically significant.

yield the susceptible and tolerant varieties, even with regular fungicide applications. The resistant varieties could be harvested multiple times, where only one harvest was possible with ‘Nufar’. ‘Obsession’ and ‘Thunderstruck’ yielded less than ‘Devotion’ at the first harvest, but were similar at the second harvest, and were noticeably slower to flower. Given the high likelihood of basil downy mildew outbreaks in late summer, growers are strongly encouraged to switch to resistant basil varieties.

CONCLUSIONS

All of the new downy mildew resistant varieties tested were fully resistant under Rhode Island conditions. In the absence of downy mildew ‘Devotion’, ‘Prospera’ and ‘Passion’ yielded as well as ‘Nufar’ when harvested for bunching, and ‘Devotion’ and ‘Passion’ yielded as well when harvesting individual leaves. ‘Obsession’ is a good alternative to ‘Everleaf’, with a similar growth habit and significantly better disease resistance. ‘Thunderstruck’ has smaller, less ruffled leaves than ‘Tuscany’ and a stronger flavor than the traditional lettuce leaf varieties. If downy mildew is present, all of the resistant varieties significantly out-

ACKNOWLEDGEMENTS

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