ARIZONA ICEBERG LETTUCE RESEARCH COUNCIL

FINAL REPORT

Project title: Role of fungicides plus lettuce genetics in management of downy mildew, 2016

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Introduction

According to a survey conducted by The Arizona Iceberg Lettuce Research Council, downy mildew is one of the top five diseases of concern to lettuce producers. This disease, caused by the fungus-like organism *Bremia lactucae*, is an obligate parasite that can only grow and reproduce on living lettuce plants. Downy mildew is a major disease in lettuce production systems worldwide. Disease epidemics can be devastating when environmental conditions are favorable for disease development.

Effectively managing downy mildew of lettuce is reliant on fungicides and planting of lettuce cultivars with genetic resistance to the disease. Many races of the downy mildew pathogen exist, and “resistant” lettuce cultivars may not have high levels of resistance to all races of the pathogen; therefore, the actual performance of these resistant cultivars will depend on the races of the pathogen present during a particular growing season. Fungicide applications will be needed if the lettuce cultivar is susceptible or if the genetic resistance package is not sufficient to control the pathogen races present in the crop.

The objective of this field trial was to evaluate the effectiveness of individual fungicides as well as treatment programs containing more than one fungicide, applied to a lettuce cultivar that was “susceptible” to downy mildew compared to efficacy on three lettuce cultivars with some genetic resistance to the disease. Fungicides tested included biofungicides as well as conventional compounds. The goal of this study was to determine if lettuce genetics plus fungicides can work together to provide a level of disease control superior to that provided by the plant or the fungicide product alone.

Materials and Methods

This study was conducted at the Yuma Valley Agricultural Center. The soil was a silty clay loam (7-56-37 sand-silt-clay, pH 7.2, O.M. 0.7%). Lettuce varieties Eblin, Telluride, Bobcat, and Bayfield were seeded Nov 7, 2016 on beds with 84 in. between bed centers, with each bed containing six rows of lettuce. Sprinkler-irrigation was used to germinate seed and grow the crop to maturity. Treatments were replicated five times in a randomized complete block design. Each replicate consisted of a 25 ft length of row on beds containing six rows of lettuce. Plants were thinned Dec 21 at the 3-4 leaf stage to an approximate spacing of 12 inches.

Treatments were applied with a tractor-mounted boom sprayer that delivered 50 gal/acre at 100 psi to flat-fan nozzles spaced 12 in. apart. Foliar applications of treatments were applied Jan 20 and 31, and Feb 13 and 23, 2017. Downy mildew was first observed in plots on Jan 18, two days before the first application of products. Maximum and minimum ranges (EF) of air temperature were as follows: Nov 7 to 30, 2016, 63-92, 35-60; Dec, 58-81, 36-55; Jan, 2017, 60-78, 34-51; Feb, 64-87, 39-56; Mar 1 to 6, 69-81, 39-54. Maximum and minimum ranges (%) for relative humidity were as follows: 7 to 30 Nov, 49-99, 9-39; Dec, 30-100, 11-79; Jan, 37-100, 12-66; Feb, 63-99, 11-56; Mar 1 to 6, 62-99, 13-29. Monthly rainfall in inches was as follows: Nov 7 to 30, 0.03; Dec, 0.99; Jan, 0.33; Feb, 0.93; Mar 1 to 6, 0.00. Disease severity was determined Mar 3 and 6 by recording the number of leaves infected with *Bremia lactucae* on 10 lettuce plants arbitrarily selected within each treatment plot. The number of downy mildew infection sites on each infected leaf ranged from a low of 4 to 5 to a high of 10 or more lesions.

Results and Discussion

The mean number of leaves infected with downy mildew at maturity on untreated lettuce cultivars Eblin, Bobcat, Telluride, and Bayfield was 3.6, 3.4, 2.4, and 0, respectively. Statistical analysis of data indicates that disease severity on nontreated Telluride plants was significantly less compared to Eblin and Bobcat and significantly higher compared to Bayfield. The effect of fungicide treatments on final disease severity on Eblin is presented in the Table. The effect of specific treatments on disease severity for Bobcat and Telluride was similar to that for Eblin and are not presented. The Table shows that several treatment programs significantly lowered final downy mildew severity compared to nontreated Eblin plants. Two potential organic fungicides, MBI-110 and GWN-10580, did not significantly reduce disease when applied alone. It is important to remember that the first application of treatments occurred 2 days after the first visual detection of downy mildew on leaves. The initial invisible infections caused by the downy mildew pathogen likely occurred several days earlier; therefore, the first application of treatments was not truly preventative in nature. The presence of treatments on plants before the onset of infection would likely have resulted in better levels of disease control. The goal at the outset of this study was to determine if lettuce genetics plus fungicides can work together to provide a level of disease control superior to that provided by the plant or the fungicide product alone. Due to the very high resistance of Bayfield (no disease observed) and the relatively low level of resistance displayed by Telluride, this goal was not achieved.

Conclusions

The following conclusions can be drawn from the results of this field trial.

- Of the four lettuce cultivars studied, Bayfield was highly resistant, Telluride was somewhat resistant compared to Eblin and Bobcat, which were of equivalent susceptibility to downy mildew.
- Compared to nontreated plants, several tested fungicide treatment programs significantly reduced the severity of downy mildew at plant maturity.

Table Effect of fungicide treatments on final downy mildew severity on lettuce cultivar 'Eblin'

Treatment *	**Rate of product per acre**	**Treatment dates**	**Mean number of infected leaves per plant**
Ranman Timorex Gold	2.75 fl oz 28.0 fl oz	Jan 20, Feb 13 Jan 31, Feb 23	2.0 d **
Ranman Timorex Gold	2.75 fl oz 14.0 fl oz	Jan 20, Feb 13 Jan 31, Feb 23	2.2 d
Actigard + Manzate Revus A-21591 Prophyt	1.0 oz + 51.0 fl oz 8.0 fl oz 5.5 fl oz 64.0 fl oz	Jan 20 Jan 31 Feb 13 Feb 23	2.4 cd
Ranman STK73	2.75 fl oz 21.0 fl oz	Jan 20, Feb 13 Jan 31, Feb 23	2.4 cd
Actigard + Manzate A-21591 Prophyt Revus	1.0 oz + 51.0 fl oz 5.5 fl oz 64.0 fl oz 8.0 fl oz	Jan 20 Jan 31 Feb 13 Feb 23	2.6 bcd
Ranman STK73	2.75 fl oz 28.0 fl oz	Jan 20, Feb 13 Jan 31, Feb 23	2.6 bcd
Manzate Zampro Prophyt	51.0 fl oz 14.0 fl oz 64.0 fl oz	Jan 20 Jan 31, Feb 23 Feb 13	2.6 bcd
Presidio	4.0 fl oz	Jan 20, 31; Feb 13, 23	3.2 ab
Mildicut	33.0 fl oz	Jan 20, 31; Feb 13, 23	3.2 ab
MBI-110	3.0 qt	Jan 20, 31; Feb 13, 23	3.2 ab
GWN-10580	2.0 qt	Jan 20, 31; Feb 13, 23	3.2 ab
Ranman + Silwet	2.75 fl oz + 2.0 fl oz	Jan 20, 31; Feb 13, 23	3.4 a
Zampro + Kinetic	14.0 fl oz + 8.0 fl oz	Jan 20, 31; Feb 13, 23	3.4 a
Dithane	1.6 qt	Jan 20, 31; Feb 13, 23	3.4 a
MBI-110 Presidio	2.0 qt 4.0 fl oz	Jan 20, Feb 13 Jan 31, Feb 23	3.4 a
Revus	8.0 fl oz	Jan 20, 31; Feb 13, 23	3.4 a
A-21591	5.5 fl oz	Jan 20, 31; Feb 13, 23	3.4 a
Nontreated plants	-------	-------	3.6 a

* Each treatment was applied to five 25-ft-long rows of Eblin arranged in the trial in a randomized complete block design.

** Disease severity values followed by a different letter are significantly different according to Fishers Least Significant Difference Test (*P* = 0.05)