Final Report

Integrative approach using fungicide and variety combination to manage downy mildew disease in Lettuce

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Introduction

The Arizona Iceberg Lettuce Research Council conducted a survey of Arizona iceberg lettuce producers to identify research priorities. Among different areas of research, Disease Control and Management received the largest number of high priority votes, with downy mildew being one of the major problem.

Every year in Yuma valley, the growers suffer economic loss in lettuce by downy mildew. Sometimes, the farmers lose up to 100% of their crop. The symptoms observed are green to yellow angular spots on the upper surface of the leaves and fluffy growth on the lower side (See Picture). Symptoms usually start from older leaves. As disease progresses the lesion turn brown and dry up and in some occasions the disease can become systemic causing dark discoloration of vascular tissue.

The pathogen *Bremia lactucae* thrives in damp, cool condition, with moisture present on leaves. Spores

are short-lived but dispersed efficiently by wind during moist period. Cultivated lettuce is the main host of the pathogen but it has also been reported to infectartichoke, cornflower and strawflower.

One of the main reason that hinders the disease management is the complexity of the pathogen. *Bremia lactucae* consists of multiple races (pathotypes), and new races continue to occur as pathogen evolves. The pathogen is one of the fastest evolving plant pathogen. And each pathotypes have developed insensitivity to fungicides to different extent.

One of the best practice is to grow resistant cultivar, but there are limitations. As the pathogen is highly variable and dynamic, resistant cultivars are not a permanent solution as the pathogen overcomes the resistance by evolving into virulent strains and isolates.

Preventative and curative application of fungicides are effective to some extent and rotation of fungicide is very important to not develop resistance against fungicide. The efficacy trial was conducted on 4 different varieties of lettuce and different fungicide treatments were screened for efficacy.

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 was seeded, then sprinkler-irrigated to germinate seed on Nov 16, 2020 on double rows 12 in. apart on beds with 42 in. between bed centers. All other water was supplied by furrow irrigation or rainfall. Treatments were replicated four times in a randomized complete block design. Each replicate plot consisted of 25 ft of bed, which contained two 25 ft rows of lettuce. Plants were thinned Jan 6, 2021 at the 3-4 leaf stage to a 12-inch spacing. Treatment beds were separated by single nontreated beds. 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.

The weather was recorded as below:

Source: https://cals.arizona.edu/azmet/02.htm

Month	Max	Min	Avg	Rain
November	80	49	64	0.00
December	69	41	55	0.01
January	70	42	56	1.31
February	75	44	60	0.00
March	77	46	63	0.00

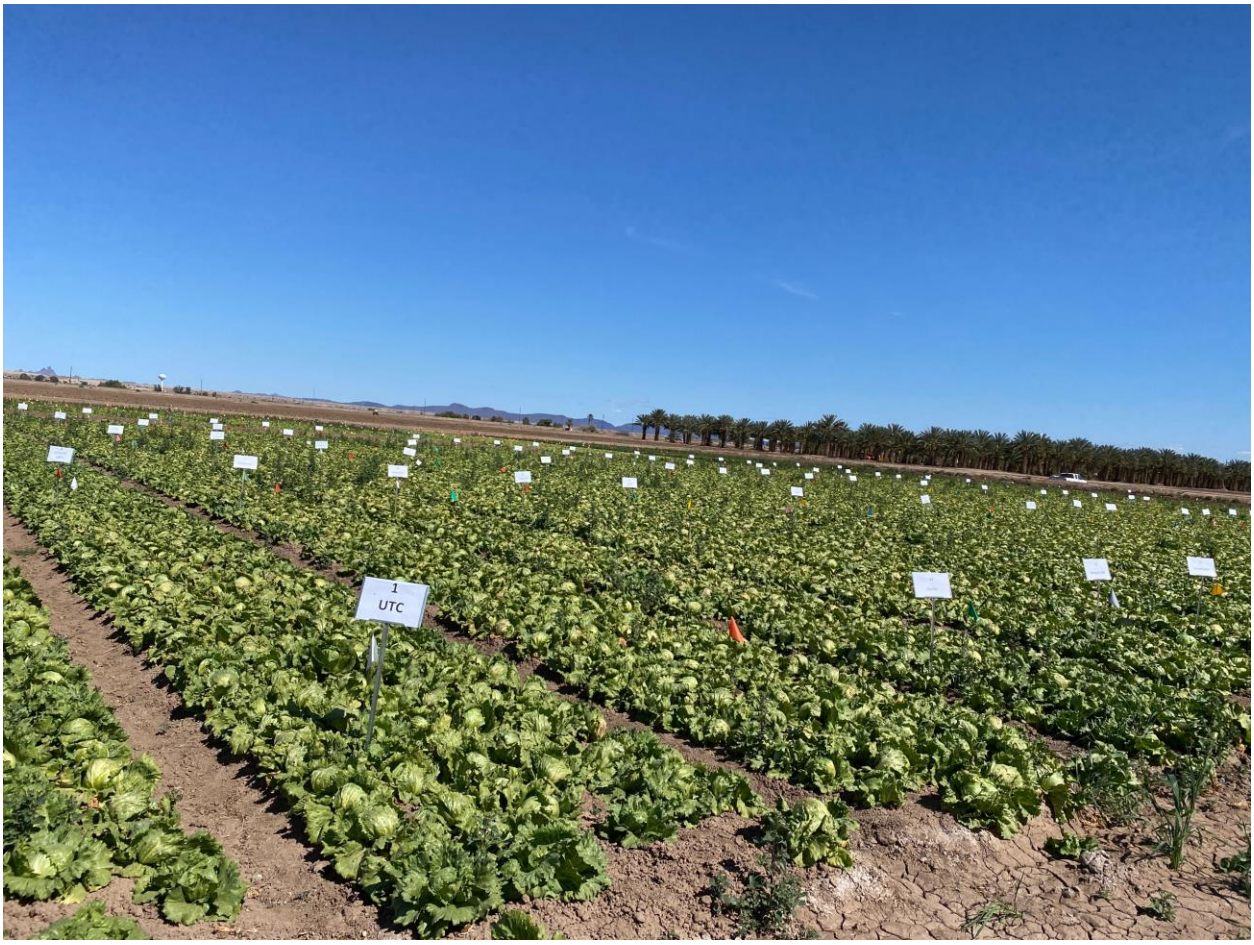
Downy mildew rating was done on 4 different commercial lettuce varieties

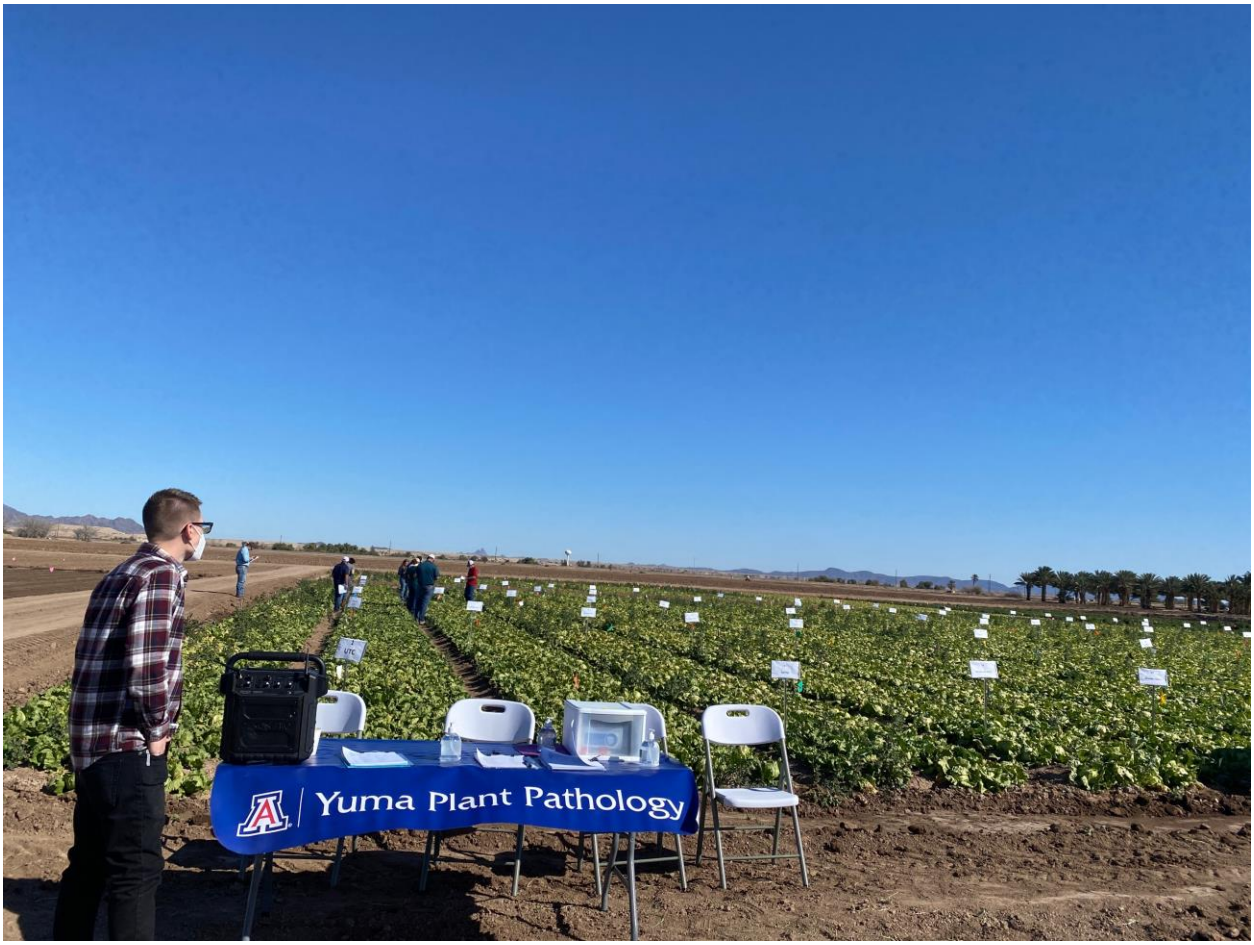
Quest, Cayote, Magosa and V7735. Foliar applications were made on February 3, 2021, February 11 2021, and February 19, 2021.

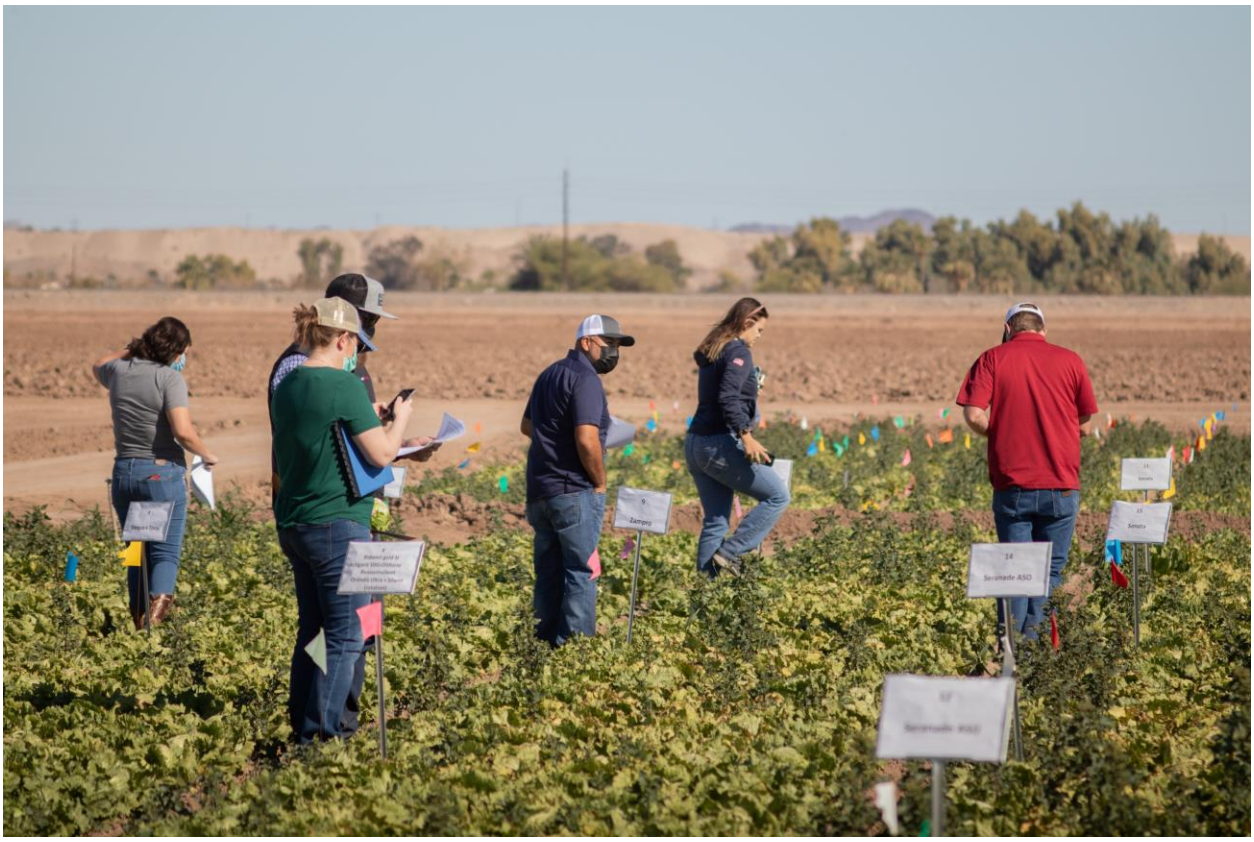
Disease severity was determined by rating 10 plants within each of the five replicate plots per treatment using the following rating system: 0 = no downy mildew present; 0.5 = one to a few very small downy mildew colonies on bottom leaves; 1 = downy mildew present on bottom leaves of plant; 2 = downy mildew present on bottom leaves and lower wrapper leaves; 3 = downy mildew present on bottom leaves and all wrapper leaves; 4 = downy mildew present on bottom leaves, wrapper leaves, and cap leaf; 5 = downy mildew present on entire plant. These ratings were transformed to percentage of leaves infected value. This was done for each variety of lettuce, and then each variety was used as replicate for statistical analysis.

Education and Outreach:

Field day was conducted on March 5, 2021 and was open to the community. Over 100 people attended the field day representing farming community, chemical industry, PCAs etc. The project received overwhelmingly positive feedback.




Yuma Plant Pathology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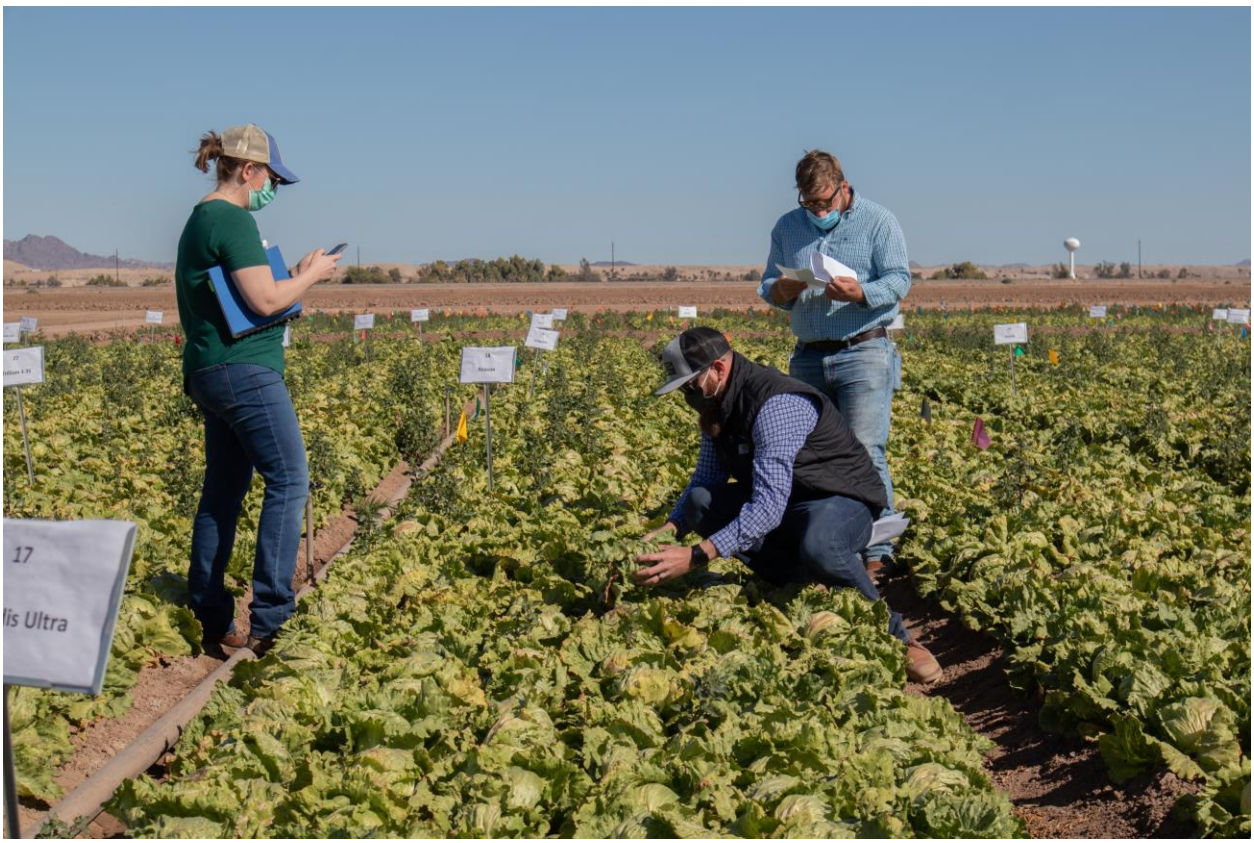
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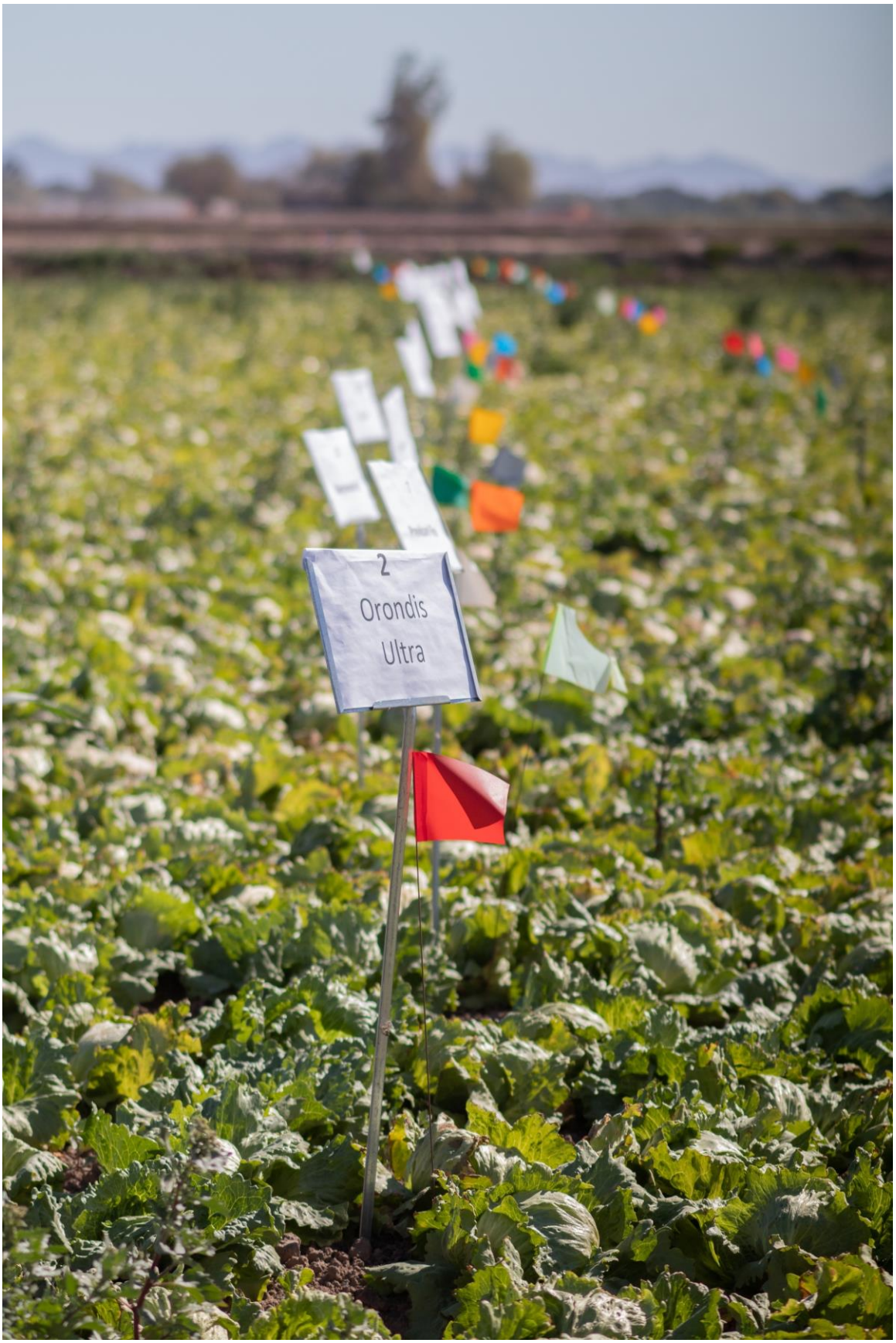
2
Orondis
Ultra

Future projects:

The plant pathology program is interested in making this fungicide trial and field day an annual program for years to come.

Results and conclusion

The data in the table illustrate the degree of disease control obtained by application of the various treatments in this trial. Most of the treatments exhibited activity against the disease to some extent. The most effective fungicides, that held the percentage of leaves that were infected to 20% or less, included Orondis Ultra followed by Revus. Phytotoxicity symptoms were not noted for any treatments in this trial.

Acknowledgements

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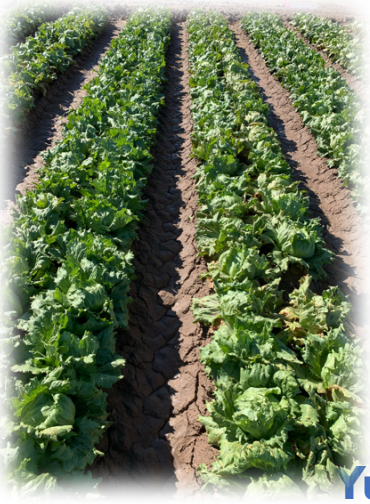
THE UNIVERSITY OF ARIZONA
Cooperative Extension
Yuma County &
Yuma Agricultural Center

Lettuce Downy Mildew Field Day

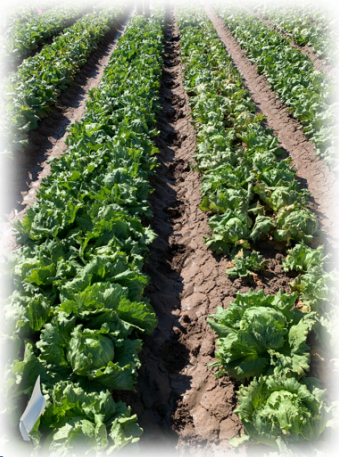
Partially Funded by:

Arizona Iceberg Lettuce Research Council

Yuma Plant Pathology's fungicide trials



4 lettuce varieties
25 + treatments
March 5, 2021
10 AM to 2:00 PM



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Yuma AG Center-Research Plot
North of 8th Street and S Avenue E
https://goo.gl/maps/vobFd9oxu6yrMfxJ8
Follow Signs

Grab and Go
Lunch Provided

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