AILRC Grant Research Project Final Report

Determination of the inherent efficacy of individual fungicide products for optimizing management of downy mildew on lettuce (11/01)

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Downy mildew, caused by the oomycete pathogen *Bremia lactucae*, is an annual concern for Arizona lettuce producers. Disease severity and resultant crop losses are highly dependent on environmental conditions. The critical factor that drives the development of downy mildew is the presence and duration of moisture on leaves. When this moisture, usually from rainfall and dew formation, is present on lettuce plants for several nights, conditions become favorable for spore formation, release, and subsequent infection of lettuce leaves by the downy mildew pathogen. Management strategies for downy mildew are heavily reliant on fungicides. To obtain maximum control of downy mildew, the first application should be made when environmental conditions favor disease but before the actual appearance of downy mildew symptoms, then continuing as long as the threat of disease persists until crop maturity. The use of mixtures or alternation of products containing different modes of action is essential in minimizing development of resistance to particular materials within the pathogen population. To deploy the most effective fungicide treatment program, knowledge of the inherent efficacy of each component fungicide within the treatment program is essential. Why? In recently completed work with powdery mildew on cantaloupe, we found that the overall degree of disease control achieved was dictated by the most effective fungicide within a treatment program. Whenever a highly efficacious fungicide was alternated with a fungicide of moderate or low efficacy, the degree of disease control was similar to that recorded when only the highly efficacious material was applied. It is reasonable to assume that the same relationship would hold for downy mildew; therefore, identifying the fungicides with the highest efficacy and constructing fungicide application programs based on these highly effective materials should maximize the level of disease control achieved and support resistance management as well. The specific objective of this field trial was to ascertain the intrinsic efficacy of registered fungicides on lettuce downy mildew. By identifying the fungicides with the highest efficacy and including them in downy mildew treatment programs, growers should be able to maximize control of downy mildew and at the same time support resistance management.

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 ‘Winterhaven’ was seeded 9 Nov, 2010 in double rows, 12 in. apart on beds with 40 in. between bed centers, then sprinkler-irrigation was used to germinate the seed. All other water was supplied by furrow irrigations or rainfall. Treatments were replicated five times in a randomized complete block design. Each replicate consisted of 25 ft of bed, which contained two 25 ft rows of lettuce. Plants were thinned Dec 19 at the 3-4 leaf stage to a 12 in. 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. Foliar applications of treatments were made 18 Jan, 28 Jan, 14 Feb, and 3 Mar, 2011. Microthiol Disperss was applied 15 Feb over all downy mildew plots to control powdery mildew. Downy mildew was first observed in plots during the first week of February. Maximum and minimum ranges (°F) of air temperature were as follows: Dec, 2010, 53-83, 31-55; Jan, 2011, 53-86, 30-56; Feb, 50-79, 26-51; 1-24 Mar, 68-90, 37-57. Maximum and minimum ranges (%) for relative humidity were as follows: Dec 2010, 57-100, 9-79; Jan 2011, 29-98, 10-34; Feb, 31-96, 7-53; 1-24 Mar, 52-89, 8-35. Monthly rainfall in inches was as follows: Dec, 0.36; Jan, 0.00; Feb, 0.43; 1-24 Mar, 0.01. The incidence of downy mildew was determined at plant maturity (24 Mar) by counting the number of infected plants within each of the five replicate plots per treatment.

The data in the following table illustrate the degree of disease control obtained by applications of the various materials tested. The intensity of downy mildew in this trial was low, with 16% of nontreated plants showing symptoms of downy mildew. All tested products significantly reduced disease incidence compared to nontreated plants; however, some products were significantly more efficacious than others. The relative ranking of efficacy among fungicides will need to be confirmed in an additional trial before meaningful comparisons among fungicides can be made.

2010-2011 Lettuce Downy Mildew Fungicide Efficacy Trial
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Treatment [1]	Rate of product per acre	Disease incidence [2]	% infected plants [3]
Forum	6.0 fl oz	1.2	2.4
Curzate 60DF	5.0 oz	1.4	2.8
Presidio 4SC	4.0 fl oz	1.4	2.8
Manzate FL 10.85LG	1.6 qt	2.2	4.4
Actigard 50WG	1.0 oz	2.2	4.4
Reason 500SC	8.2 fl oz	2.4	4.8
Quadris 2.08SC	15.5 fl oz	2.8	5.6
Aliette 80WDG	5.0 lb	3.0	6.0
Revus 2.08SC	8.0 fl oz	3.4	6.8
Tanos 50WG	10.0 oz	3.4	6.8
Manzate Pro-Stick 75WG	2.1 lb	3.4	6.8
Previcur Flex	2.0 pt	3.6	7.2
Cabrio 20EG	16.0 oz	4.0	8.0
Nontreated control	**-------**	**8.0**	**16.0**
LSD (Least Significant Difference, *P*=0.05)		**1.3** [4]	

1 Foliar applications of treatments were made 18 Jan, 28 Jan, 14 Feb, and 3 Mar, 2011. Downy mildew was observed in plots during the first week of February.

2 The mean incidence of downy mildew caused by *Bremia lactucae* was determined at plant maturity (24 Mar) by counting the number of plants with disease symptoms within each of the five replicate plots per treatment.

3 The mean percentage of plants within each plot showing symptoms of downy mildew. The stand count within each plot was approximately 50 plants.

4 Least Significant Difference at $P = 0.05$.