Efficacy of Plant Inducers and Biopesticides for Management of Downy Mildew on Sweet Basil

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Fig. 1. Basil downy mildew symptoms, showing leaf yellowing delineated by veins, and greyish sporulation visible on the lower leaf surface.

Introduction

Basil downy mildew, caused by *Peronospora belbahrii*, is presently the most devastating disease of basil worldwide (Fig. 1). With nearly all sweet basil varieties exhibiting extreme susceptibility, it has been difficult to control, particularly in organic production. However, the recent release of a commercial line displaying partial resistance has provided some hope for improved management. A field experiment was conducted to investigate management of downy mildew using this resistance with comprehensive management strategies. These programs involved the use of plant activators (SAR or Systemic Acquired Resistance compounds) along with foliar applications of reduced risk fungicides.

Materials and Methods

A downy mildew susceptible variety (Genovese) and a basil line displaying partial resistance (Eleonora, released by Enza Zaden) were planted in commercial basil field using a split plot design with variety as the main effect. Basil transplants were set in the field on March 28 on raised beds covered with plastic mulch. Beds were formed on 5 foot centers and basil was spaced at 6 inches within the row with 12 inches between the two rows per bed. Experimental units consisted of 12-ft bed sections separated on the ends by 5-ft alleys. Three SAR compounds, Actigard, Regalia, and Vacciplant, were applied at weekly intervals, starting the day after transplant. All compounds were applied using a CO2 backpack sprayer equipped with a three-nozzle boom delivering spray at 30 psi in a volume of 62 GPA. SAR treatments were applied alone or in combination with two low-risk fungicides, Badge, a copper fungicide, or Serenade, a bio-fungicide consisting of *Bacillus subtilis*. These later treatments were applied twice weekly. Mildew developed from natural sources and was rated by visually assessing the percentage of foliage displaying mildew symptoms on 17 and 28 April.

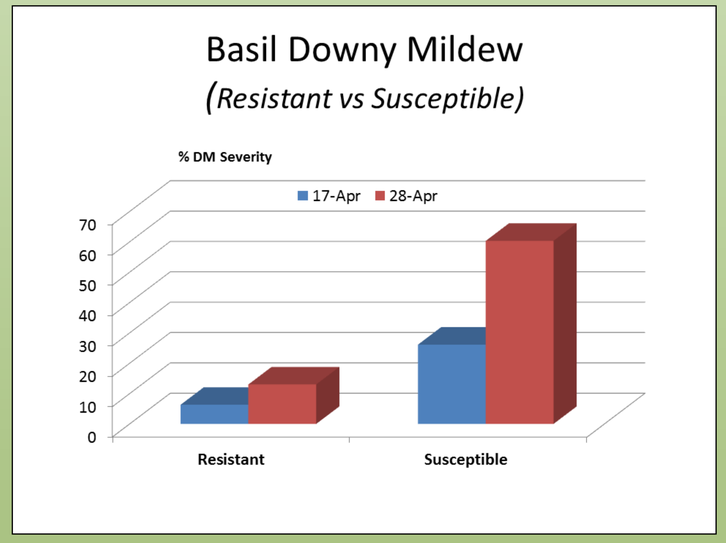

Fig. 2. Basil downy mildew severity averaged across treatments for the susceptible variety Genovese, and the resistant variety Eleonora.

Results

Disease assessments show that downy mildew was significantly influenced by variety (Fig. 2), with Eleonora displaying far lower severities than the Genovese during the course of the study. However, by itself, host plant resistance did not provide for severities sufficient for basil to be marketable, amounting to about 20% at the last rating, and declining rapidly when inoculum pressures became extreme at the end of the trial. In examining the plant activators, averaged across the respective foliar treatments, SAR compounds consistently provided for lower downy mildew severities, although reductions were not always significant (Fig. 3). Reductions in severities due to SARs were proportionately greater for the resistant variety Eleonora than for the susceptible Genovese. In general, the addition of bi-weekly foliar sprays with copper or the bio-pesticide Serenade enhanced the level of SAR mildew control, but this improvement was not consistently significant.

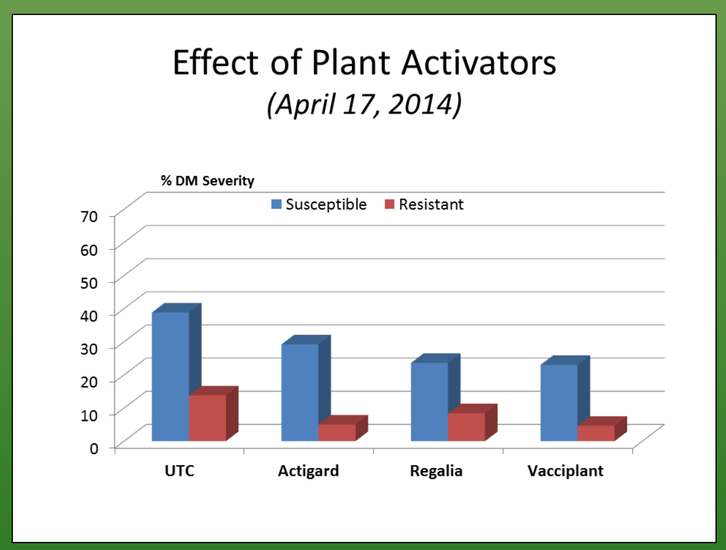

Fig. 3. Basil downy mildew severity averaged across treatments as influenced by plant activators or SARs.

Conclusions

On the susceptible sweet basil variety Genovese, plant activators, either alone or coupled with copper or biofungicides could not reduce mildew severities to marketable levels (Fig. 4). By the second rating period, treatments were nearly indistinguishable, with severities of 60%. Overall, plant activators provided suppression but not sufficient control. Reductions with SARs were higher for the resistant variety Eleonora (Fig. 5), and appeared to be enhanced when combined with copper or the biofungicide Serenade. But again, these reductions were not sufficient to obtain a marketable crop, and treatment differences dissipated as the crop developed. In summary, these results offer hope but not a solution for management of downy mildew on organically grown basil. A higher level of host plant resistance is needed and this must be used in comprehensive management strategy.

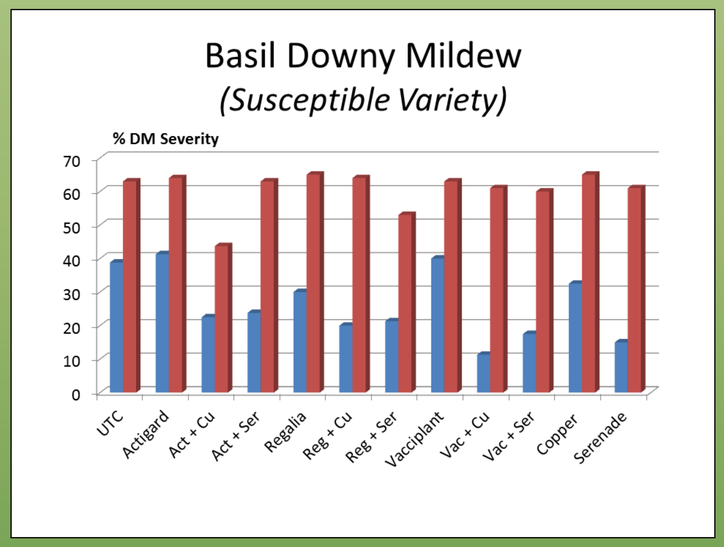

Fig. 4. Basil downy mildew severity for individual foliar treatments on the susceptible variety Genovese (blue – April 17, red – April 28).

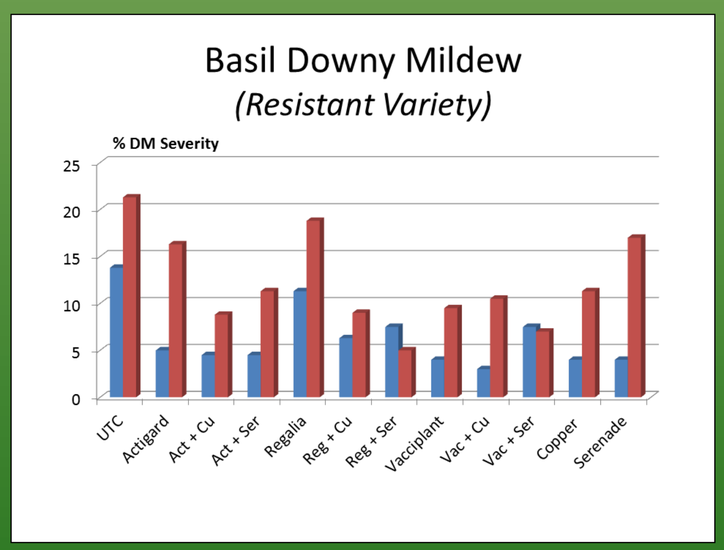

Fig. 5. Basil downy mildew severity for the various foliar treatments on the resistant variety Eleonora (blue – April 17, red – April 28).