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Powdery Mildew Field Day

A Cooperative Extension Resource for Changing Conditions

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POWDERY MILDEW (caused by *Erysiphe necator*, a common fungal parasite) is a disease which negatively impacts vineyards across California. Its ability to cycle through multiple generations per year can result in major losses to crop quality and yield, making it one of the most economically important diseases of grapes worldwide.

University of California, Cooperative Extension Specialist, Dr. Akif Eskalen and his plant pathology lab have researched solutions to control pathogens in agronomic crops for the past several years; these include grapevine trunk disease (GTD) (i.e., esca, *Eutypa* and *Botrytosphaeria* canker diseases) and other fungal diseases such as powdery mildew and Botrytis bunch rot. These diseases are of constant concern for grape growers across California and are typically kept in check with a series of cultural practices and the use of different fungicides.

However, besides sulfur, horticultural oils and/or synthetic pesticides, other options for control of pathogens such as powdery mildew exist. These include soft chemicals, biologically-based formulations, and cultural management practices. Many of these alternative options are utilized in the grape-growing industry already but may lack sufficient testing to allow for confident recommendations for effective use.

UCCE plant pathologist Akif Eskalen discusses results of the powdery mildew trials with field day attendees.

The incidence of powdery mildew was exceptionally high in California in the 2023 growing season. This may be due to a high volume of precipitation in winter and spring which led to more vigorous vines, and/or spring temperatures ideal for fungal growth. The Powdery Mildew (Thomas-Gubler) Risk Index values remained high from late-April through mid-July 2023, indicating a year with conditions that support favorable development of *E. necator* in vineyards across the state.

At the end of July, amid high powdery mildew pressure, the Eskalen lab at UC Davis hosted an annual Powdery Mildew Field Day for growers and other members of the viticulture industry. On display were field trials of numerous chemical and biological controls for powdery mildew and the degree of control provided by these compounds at the site. These studies are housed at the UC Davis Plant Pathology Fieldhouse Vineyard (cv Chenin blanc) in Davis, Calif. This small research vineyard covers approximately 2.5 acres on the South Campus of UC Davis and serves as a unique and much-needed resource for research on plant pathology and best management practices for control of plant pathogens. While collaboration with private growers is a useful and valuable resource for Cooperative Extension research, dedicated sites such as these are often beneficial for destructive or disease-based studies on crops. This also helps limit the damage or incurred costs by collaborator-growers.

Two Trials at Field Day

Two trials were on display at the field event. Trial I consisted of 28 different treatments of synthetic fungicides alone or in combination with soft chemistry products. Trial II consisted of 20 combinations of soft chemistry products, including biologicals, sulfurs, nutrient applications, oils, and other organic materials. Control efficacy varied drastically among treatments in both trials, with acute contrasts in disease signs and symptoms visually apparent. Attendees of the field day included industry members specializing in pathogen control, pest control advisors, UCCE farm advisors, and graduate students.

Dr. Eskalen's description of the polycyclic nature of powdery mildew began the day and provided insight into the difficulties of mitigating damage from the multiple generations of disease that grape growers can face each year. Powdery mildew performs well in Mediterranean climates such as California, requiring wet conditions only to release spores from their overwintering structure (known as chasmothecia) and germinate; however, no moisture is needed for growth of the pathogen following the initial infections in the spring, or the production, dissemination, and germination of the "repeating" spores (conidia) produced from new infections throughout the rest of the growing season. The time needed for a new generation of infections to develop and produce their own conidia to further disease spread is governed primarily by temperature (the basis of the Gubler-Thomas model), and is only five to seven days at temperatures of 63 to 86°F. This means most of

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The level of the infestation covered with a few cleaner berries. It also shows the secondary symptoms of powdery mildew on the cane. Those island-looking black symptoms on the cane are also caused by a powdery mildew pathogen.

California has ideal environmental conditions for the growth and spread of powdery mildew throughout long periods of the growing season.

"Synthetic materials are available that work most of the time," noted Akif Eskalen. "However, it is a good idea to alternate or combine different materials to reduce the risk of resistance developing. Alternating the use of fungicides with different modes of action is strongly recommended to prevent pathogens from developing fungicide resistance. Fungicides are classified by the Fungicide Resistance Action Committee (FRAC) on the basis of their mode of action, and this information is provided on product labels. All fungicides showing a common FRAC code on their label have the same mode of action. Thus, effective rotation should involve the use of products that do not have the same FRAC code."

The trials highlighted at the Powdery Mildew Field Day focused on applicable controls for management of the disease. Due to the objectives of the project, vineyard canopy management was kept to a minimum of basal leaf removal on the morning-sun side of the canopy. Previous research has shown that powdery mildew pressure can be significantly reduced by applying proper leaf and lateral removal. Canopy thinning increases airflow, incoming ultraviolet radiation, and can increase temperatures on the clusters to an unfavorable level; these impacts collectively limit development of this disease. These same practices can also greatly increase the deposition of fungicide sprays onto the clusters, further augmenting control.

In addition to Dr. Eskalen's presentation, attendees had the opportunity to discuss best management practices (BMP) for Powdery Mildew with members of the Eskalen Lab. UC Davis Ph.D. candidate Marcelo Bustamante discussed the rising interest in biological control methods for powdery mildew and the place this control method has in complimenting others. On their own, biocontrol agents of *E. necator* may have low-to-no efficacy. However, in combination with synthetic fungicides or soft chemicals they can help growers reduce the number of synthetic fungicide applications necessary to control the resident pathogen. This may help reduce synthetic fungicide application in vineyards significantly as the science behind biocontrol of fungal pathogens continues to develop.

Results for the Real-World

The event provided an opportunity for the University of California to fulfill its promise of extension and outreach to the agricultural communities of California. The importance of having access to many options for control of pathogens in vineyards cannot be overstated. As conditions change and living organisms adapt to thrive in higher temperatures and other novel environmental variables, growers of crops such as grapes will need more options for pathogen control.

While synthetic fungicides are useful in most situations, soft chemistry, biocontrol agents, and combinations of these categories are going to become more important to address the potential for fungicide resistance in pathogens. Research such as the trials described at the Powdery Mildew Field Day are more necessary than ever for maintenance of our agricultural industries in California. As climates change, growers will need new tools to address changes in pathogen pressure and researchers at the Eskalen Lab are helping to test and highlight new options for grape growers. **WBM**

A full report of this study is available: *ucanr.edu/sites/eskalenlab/files/386851.pdf*.

For more information about ongoing and completed work by the Eskalen Lab, visit their website: *ucanr.edu/sites/eskalenlab/*.

For information on the Powdery Mildew Risk Assessment Index visit the UC IPM website: *ipm.ucanr.edu/weather/grape-powdery-mildew-risk-assessment-index/*.