

IT'S TIME TO MOVE ON FROM THE POWDERY MILDEW RISK INDEX (PMI):

Root Applied Sciences vs. PMI.

www.rootappliedsciences.com



THE PROBLEM

Powdery mildew remains a persistent threat to grape production, with viticulturists using more chemicals to control this disease than any other vineyard problem. Traditionally, fungicide applications are timed at intervals according to the **Powdery Mildew Risk Index (PMI)**, (i.e., Gubler-Thomas risk index). While this is an improvement from fixed interval fungicide applications, using the PMI can still result in inefficient use of fungicides. This occurs because the PMI incorrectly assumes that powdery mildew spores are always present, leading to disease risk overestimation and recommendations for fungicide applications that are not needed.

In California, the PMI regularly overestimates the risk of powdery mildew resulting in fungicide spray programs similar to fixed-interval spray programs. As a result, after several years of working with the PMI, many grape growers feel this tool is not really working. "The PMI has prevented management failures due to powdery mildew for nearly 20 years; however, it is time for an improvement on this conservative approach. "Today's growers have a distinct advantage over their predecessors: the ability to precisely monitor airborne powdery mildew spores using Root's cutting-edge technology," says **Sarah Placella**, Ph.D., CEO of Root Applied Sciences ("Root").

OUR SOLUTION

Root's patented-pending technology **monitors and captures powdery mildew spores using a series of in-field sensors that generate alerts of the pathogen's quantity** so growers can spray fungicides only when necessary (Figure 1). According to Root's scientific team and other plant pathology experts, it is clear that using the PMI leads to the over-application of fungicides when disease pressure is low (i.e., the density of the pathogen is low). However, using Root's technology, growers can now monitor disease pressure and more accurately assess when and where interventions are needed. This way growers can manage the disease more precisely, stretching spray intervals when there is no threat, and focusing scouting and cultural practices in hot spots of disease

PROVEN SUCCESS

Root's technology has demonstrated undeniable success in diverse seasons. In 2021, when powdery mildew pressure was low, early adopter **Caleb Mosley** drastically reduced sprays from the recommended 11 to just three, showcasing the system's ability to align treatments with actual disease risk. "Determining when to begin fungicide applications is a critical component of every successful plant protection plan. Incorporating Root's sensors into our decision-making process has allowed me a high level of confidence that we are only applying materials at the onset of the growing season when it's absolutely necessary," says Mosley.

**SARAH
PLACELLA,
PH.D**

CEO, Root Applied Sciences



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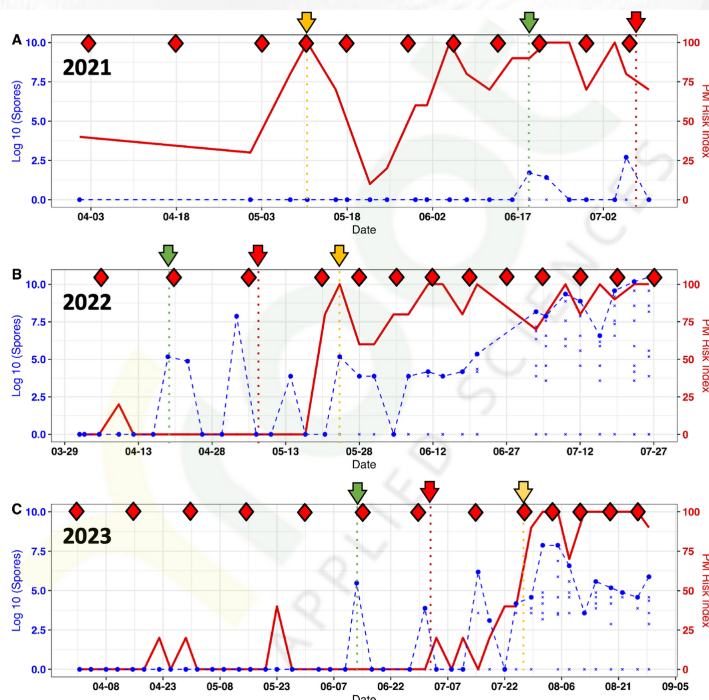


Figure 1. Powdery mildew risk index and spore counts at a vineyard located in the Carneros AVA in (A) 2021 (B) 2022 and (C) 2023. The red line represents the Powdery mildew risk index. A dashed blue line connects the highest spore count detected by a network of six Root sensors during each monitoring period. Diamonds represent sulfur sprays adjusted according to the PM risk index as follows: applications every 15-days with values between 0-30, applications every 10-days with values between 30-60 and applications every 7-days with values above 60. Key milestones are highlighted with arrows: the green arrow denotes the 'First Detection of Spores by RAS Spore Traps,' the red arrow signifies the 'First Time Symptoms are Detected in the Field,' and the yellow arrow represents the 'First Prediction of High Risk by PM Risk Index.'

Conversely, in the high-pressure year of 2022, **Meghan Murphy** at Gundlach Bundschu **cut 40% of sulfur sprays**, successfully managing disease despite one of the highest powdery mildew pressures in decades. "It was a super high-pressure year in our region, but we didn't feel it because we had reliable data and knew what we needed to do" - says Murphy, Sustainability Manager at Gundlach Bundschu. In fact, while many growers reported among the highest powdery mildew pressure in decades, Root's customers generally assessed 2022 as average powdery mildew pressure, perhaps because they were able to appropriately time early sprays to tamp down the fungus before it took hold. These real-world examples emphasize Root's adaptability to varied conditions.

AN ADAPTABLE SOLUTION

In the cooler climate of 2023, Root's third year in the market, the correlation between the PMI and Root's sensors improved, allowing growers to make informed decisions. In regions like Carneros and Freestone, where disease risk was lower early in the season, growers extended the time between spray treatments, even moving beyond the traditional 14-day schedule. However, in other areas like Napa Valley, where the Grape Powdery Mildew Risk Index peaked earlier during the season, a more conservative approach with applications every 10-12 days was opted for. This nuanced response to diverse conditions highlights Root's adaptability, enabling growers to tailor their strategies based on real-time data, ultimately optimizing disease management.

FINANCIAL AND ENVIRONMENTAL GAINS

The financial benefits of using an improved system to optimize the timing of sprays are also substantial as reducing sprays reduced the per-acre management cost of fungicide applications to control powdery mildew, from **an average of \$700 per acre in fungicide applications to roughly \$490; a savings of approximately \$210 per acre** for Root's customers in 2022. However, the benefits are not only financially favorable, they are also environmentally and sustainably appealing. Using fewer fungicides results in labor and energy savings (e.g., fuel) as fewer tractor passes are needed to apply fungicides.

HOW ROOT'S PM MONITORING SYSTEM WORKS

Our monitoring service operates by deploying a network of sensors to precisely monitor the concentration of PM spores in commercial vineyards. Our sensors actively draw air into a tube where spores are captured. The sample tubes are collected 2 times per week by growers and sent to our laboratory, where our DNA-based platform allows the quantification of spores in the sample.

MEGHAN MURPHY

Sustainability Manager
at Bundschu Company



"It (2022) was a super high-pressure year in our region, but we didn't feel it because we had reliable data and knew what we needed to do"

DATA DRIVEN FARMING

Additionally, Root's system not only optimizes spray timing but also offers regular feedback, empowering growers to make informed decisions. "Yeah, I cut a few sprays, but the greater value was seeing Root's data from the vineyards twice a week. I knew there was powdery mildew, but I also knew that the levels were below a threshold we're comfortable with. So, I was able to spray with more biologicals knowing that if powdery mildew wasn't being well controlled, I would know in time to adjust our spray program. In the end, I was able to get through the whole season using biologicals on the majority of my blocks," said **Tony Chapman**, Director of Winegrowing at the Donum Estate.

Like Root, many other companies that work with in-field sensors are helping growers dive into a new area of data-driven farming aimed at mitigating agricultural issues related to labor shortages, water, and sustainability.

Join the Revolution! Test Root's Technology Today and Transform Your Grape Growing Experience.

