

CASE STUDY: CHARLES KRUG FAMILY VINEYARDS TREATMENT OF A GRAPEVINE LEAFROLL DISEASE-INFECTED PLOT WITH **TERRABELLA®**

Vineyard manager Joe Martinez of Charles Krug Family Vineyards standing in front of an ailing 22-year-old vineyard plot prior to treatment with **TerraBella®**.



| | |
|--------------------------|--|
| Product User: | Charles Krug Family Vineyards, St. Helena, CA, USA |
| Issue: | 37 acre, 22-year old vineyard with low Brix content fruit, averaging 23%, making the fruit unusable in wine production. In addition to low Brix, these vines were also suffering from Grapevine Leafroll Disease, resulting in many fruit bodies falling off the vines before maturity. Absent an effective solution, these vines required re-planting, foregoing an estimated 10+ year remaining useful life. |
| Treatment: | Standard three-stage TerraBella® application. |
| Treatment Result: | After treatment, vineyard test area produced fruit with an average Brix content of 26, well above target threshold of 24 for wine production. |
| Treatment Benefit: | This treatment, should results be sustained, will result in a 10+ year extension of the useful life of these vines. During the initial 4-year period, during which production is otherwise lost as vines are replaced, the net economic gain is \$60,000 per acre. |
| Incremental: Benefits | Fruit on treated vines showed an increase in potassium levels from 2.7% to 3.5%. No significant pH change was seen between treated and untreated areas. |

The following graphs support the above data. Tables 1, 2, and 3 show test results (**TerraBella®**-treated and untreated plots) for Brix, pH, and potassium levels, respectively. In Tables 1 and 2, the blue and red bars for each plot reflect duplicate testing done on the Brix content to ensure test reliability.

Table 1 Brix content of juice from untreated and TerraBella-treated grapevines.

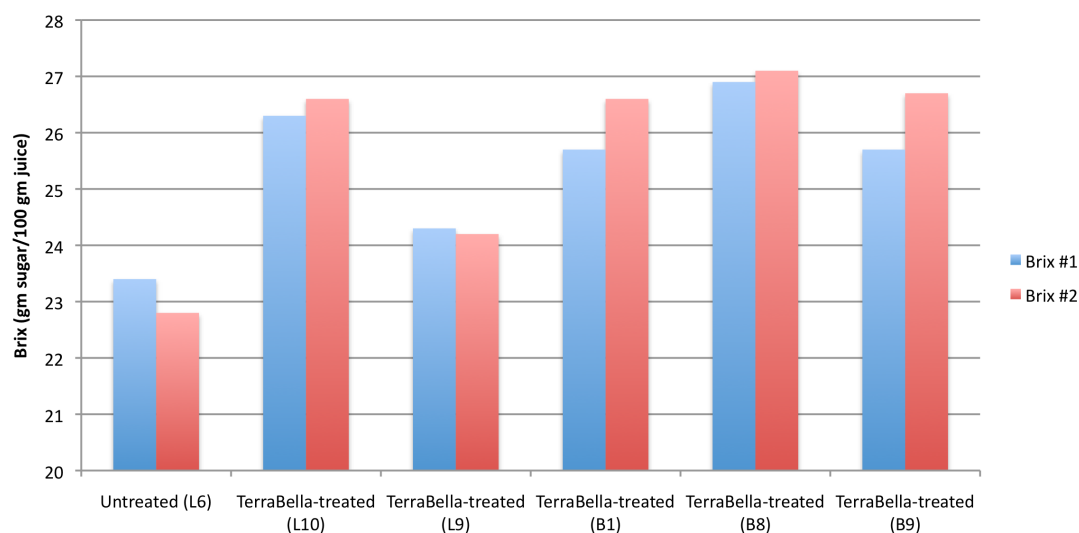


Table 2 pH of juice from untreated and TerraBella-treated grapevines.

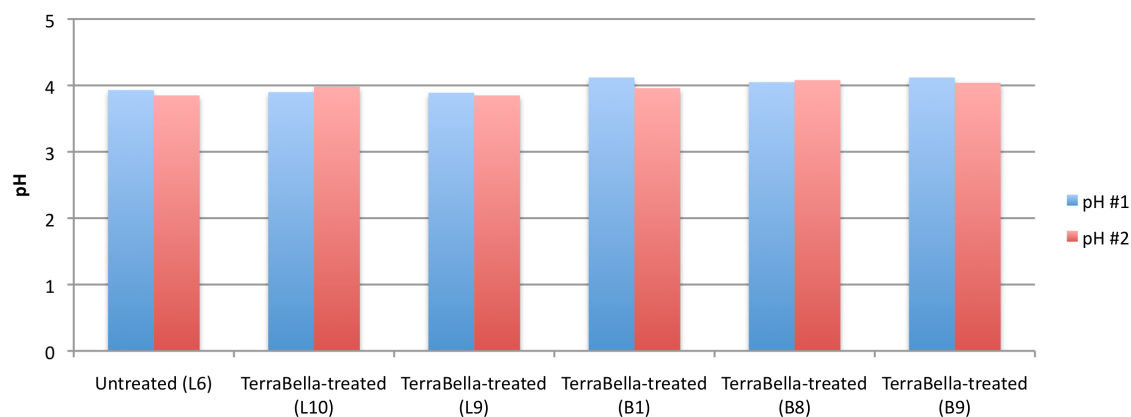
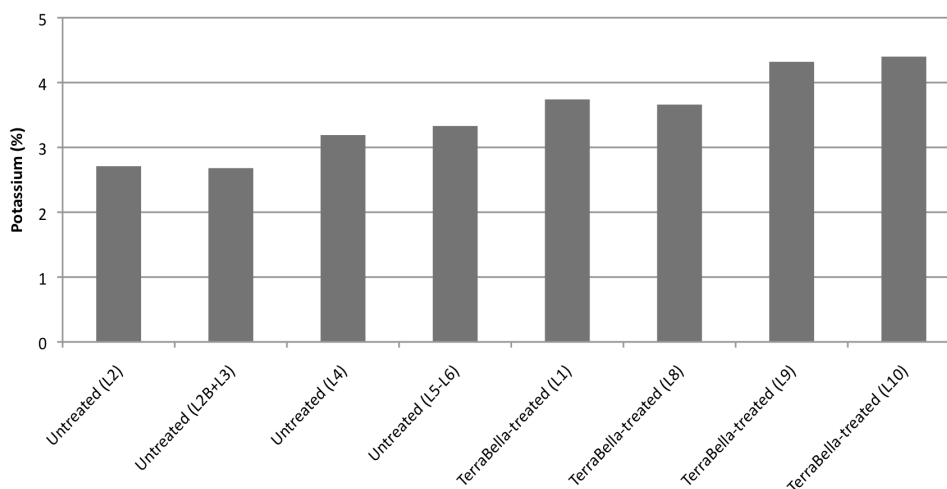


Table 3 Potassium in TerraBella-treated and untreated grape petioles.



Conclusion and Explanation:

The ailing plot that was treated with **TerraBella®** had Grapevine Leafroll Disease (GLD), a common symptom of which is low Brix. **TerraBella®** contains numerous microbes that can help mitigate/prevent plant damage due to both abiotic and biotic stress. One potential mechanism a plant can use to suppress disease mediated by viral pathogens such as GLD is “induced systemic resistance”. **TerraBella®** contains beneficial microbes that have been shown to help induce systemic resistance in plants. In addition to the increased Brix, the evidence that **TerraBella®** helped mitigate grapevine damage from GLD included visual indicators. Says Joe Martinez, a vineyard manager with Charles Krug – Peter Mondavi Sr. Family Vineyards, “On the plots where I had the **TerraBella®** I did not see any red spots on the leaves that exist in the other plots which is a great benefit for us”.

Tracy Letain is a PhD microbiologist who has spent several years studying nitrogen cycling and metal redox chemistry in the environment, and various other issues related to water quality and soil fertility for the Department of Energy and for the State of California. She currently works as the Chief Technology Officer for AquaBella Organic Solutions. All data used for this report were provided by Charles Krug – Peter Mondavi Sr. Family Vineyards.

For more information about TerraBella®, or this case study, please call AquaBella Organic Solutions at (1) 707-829-3347 or email info@aquabellaorganics.com.