

Economic loss in California's table grape vineyards due to measles

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Measles (syn. Esca, Black Measles or Spanish Measles) has long plagued California grape growers with its cryptic expression of symptoms and lack of identifiable causal organism(s). Recently, two genera of fungi have been implicated as the cause of Measles and grapevine decline, a disease that affects young vineyards (Rooney, 2005). *Phaeomoniella chlamydospora* and *Phaeoacremonium* spp. fungi have been isolated from vines displaying symptoms throughout California's vineyards and their surrounding flora (Eskalen, 2005). Grapevine pruning wounds and natural cracks located on the trunks and cordons were found to be populated with perithecia that resembled Togninia, the teleomorph of related species within *Phaeoacremonium*. Identifying the causal organisms has brought researchers and growers closer to deciphering a disease cycle and management program but it continues to cause economic damage to California's grape industry.

Although measles affects all grape production systems, table grape growers experience the greatest market loss. The demand for blemish-free fresh market grapes has increased worldwide. California's fresh market grape production exceeds \$1 billion with over 16 cultivars being exported to more than a dozen countries. Producing grapes for the fresh market is an intensely laborious system with growers managing vineyards year round at a cost exceeding \$6,000 per acre (Vasquez, 2004). Although all cultivars grown for the fresh market are susceptible to measles, 'Thompson Seedless' and 'Flame Seedless' are most commonly affected.

Fruit displaying measles must have symptomatic berries removed prior to being packed. Entire clusters are left on the vine when the majority of the berries have measles, which leads to other disease problems (i.e. bunch rot). Typical fruit symptoms include black speckling which gives measles its name. The black spots begin appearing shortly after fruit set and continue through harvest, often coalescing, and turning entire berries black. Fruit that is severely affected often cracks, rots or dries on the vine. Fully mature grapes that suddenly display measles symptoms near harvest, often have an acrid taste, even when only a few berries are affected. Interveneal chlorosis and necrosis define typical foliar symptoms and much like fruit symptoms, appear throughout the growing season at varying degrees of severity. Combined, these symptoms describe the chronic nature of measles. A more severe form known as Apoplexy presents itself by complete loss of foliage and fruit. Vines displaying apoplexy are often found throughout a vineyard and may or may not show the symptoms the following season.

Previous work has been done to estimate the economic damage of *Eutypa lata*, a wood decaying fungus that affects grape yields. (Siebert 2001). Focusing on grapes produced for wine, Siebert found that *E. lata* has the potential to cause over \$260 million in crop loss for the winegrape industry. In this study, we attempt to estimate the value of the crop loss to measles. Instead of calculating loss over the entire fresh market grape industry, vineyards with varying degrees of measles are used to estimate loss due to measles. San Joaquin Valley vineyards planted to the cultivar 'Thompson Seedless' were surveyed to determine the economic impact of measles on grape production for the fresh market.

Four, one-acre 'Thompson Seedless' vineyards were surveyed for disease incidence and severity during the 1997-98 growing seasons. The vineyards were similar in characteristics including age (24-30 years old), grown on a standard T-trellis, furrow irrigated, and grown for the fresh market. Foliage and fruit were rated for disease incidence and severity. Severity was rated using a system that assigned scores that ranged from 0 (no symptoms) to 5 (100% fruit symptoms). Each vineyard was surveyed once a month beginning in the spring and ending at harvest. Weight comparisons were made between unblemished and infected fruit in order to estimate economic loss (Figure 1).

Table 1 shows the economic loss in the four vineyards displaying measles. In 1997, disease severity at harvest ranged from 35 to 54 percent for Madera and Kern, respectively. In 1997, Madera had a \$784/A

loss compared to a \$458/A loss for Kern, which had a higher severity rating and less boxes per acre. Disease severity at harvest ranged from 33 percent for Tulare-2 and 56 percent for Tulare-1, in 1998. In 1998, both vineyards averaged 711 boxes per acre. Madera's loss equaled \$307/A while Kern's losses amounted to \$275/A due to measles. The greatest loss was experienced by Tulare-1 at \$699/A, which also produced the least amount of boxes per acre.

The data shows that fruit yield and dollar loss can be substantial when table grape vineyards are infected with measles. Table grape vineyards often range between 500-1,000 acres in size planted to a single cultivar. When vineyards of this size display fruit symptoms, economic loss can be between \$250,000-2,000,000. Although significant, these estimated financial losses may not be enough for a grower to decide to pull a vineyard. Cultivar, total boxes per acre and the market often dictated the fate of a vineyard fruit destined for the fresh market. Additional research is needed to identify management strategies that minimize infection and increase long-term productivity and fruit quality.

Acknowledgements

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References

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Figure 1. Economic loss due to measles in four Thompson Seedless vineyards—1997-98.

