Update on Red Blotch Disease Research from Southern Oregon

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Grapevine red blotch-associated virus (GRBaV) is a graft-transmissible virus belonging to the family *Geminiviridae*. In 2013, researchers at Cornell University confirmed that GRBaV was responsible for red blotch disease in grapevines. Classical symptoms of red blotch disease are similar to those of leafroll disease including reddening of basal leaf margins starting around véraison, and often, but not always, pink or red leaf veins (Fig. 1). However, unlike leafroll disease that exhibits cupping or downward rolling of leaf margins, leaf margins of red blotch-infected vines tend to be relatively flat. The progression of reddening on a shoot is typically acropetal, starting at the basal section and working its way upwards to the shoot apex or tip. White cultivars can also have this disease; symptoms include chlorosis or yellowing of leaf blades. GRBaV is spread readily via infected propagation material, and research is currently underway to determine whether insect vectors are capable of transmitting the virus.

During the 2014 growing season, we documented the physiological performance of red blotch-infected 'Cabernet franc' grapevines in a commercial vineyard in southern Oregon, as well as assessed the effects of red blotch on grape yield and composition. Only the lower (basal) one-third of canopies showed symptoms of red blotch disease in 2014 by the end of the season, so the canopies appeared relatively healthy for most of the growing season. The vines did not experience water stress throughout the study based on measurements of predawn and midday stem water potentials. In comparing pre- with post-véraison periods, the latter when symptoms of red blotch began to appear on the leaf margins (Fig. 1, left), our measurements of leaf gas exchange on mature *green* leaves indicated 40-50% decreases in photosynthesis and stomatal conductance. During the same period, SPAD readings of leaf chlorophyll content indicated a decrease of approx. 20%; while healthy grapevines have SPAD values in the low- to mid-40s, our red blotch vines had SPAD values in the low- to mid-30s. Finally, chlorophyll fluorescence, a powerful technique to measure photosynthetic performance in plants, was used to determine whether the red blotch-infected vines were experiencing any stress. In comparison to healthy grapevines that typically have maximum PSII quantum yields (F_v/F_m) over 0.80 both pre- and post-véraison, our red blotch-infected grapevines had values similar to 'healthy' values (> 0.80) pre-véraison, but dropped down to ~0.65 post-véraison, indicating stress to the photosynthetic apparatus of the leaves at that time.

Fruit composition from all the vines was within an acceptable range for a commercial harvest. Soluble solids were between 25-26 °Brix, pH was approx. 3.2, and titratable acidity was between 5.5-6.3 g/L. Therefore, despite decreased physiological performance of the canopy, there did not appear to be negative effects of red blotch disease on yield or composition of Cabernet franc grapes in 2014, a season marked by warm, dry conditions and early ripening in southern Oregon. However, in seasons with less favorable environmental conditions that would contribute additional stress to the vines, fruit ripening rate and composition at harvest is likely to be negatively affected. Ongoing work in this area will investigate whether any physiological differences exist between GRBaV-free and infected vines, as well as how the virus affects other red grapevine cultivars in southern Oregon and the Willamette Valley.

Fig. 1: Typical symptoms of red blotch disease shown here on 'Cabernet franc' at a commercial southern Oregon vineyard. **(left)** onset of red blotch on leaf margins; **(middle)** advanced stage of the disease, typically around harvest; **(right)** browning or bronzing of red blotched leaves observed late in the season on the south-facing side of the canopy that is subject to greater radiation. Photos by Vinay Pagay.