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Water management is considered one of the most important means of achieving high quality wine grapes (1). Most wine grapes are irrigated by surface drip irrigation, considered to be an efficient means of watering compared to other contemporary methods. However, application of water to the soil surface contributes to water losses from both evaporation to the atmosphere and use by weeds. Surface drip irrigation also tends to concentrate the roots in the upper soil profile, which dries rapidly during summer temperatures, requiring frequent irrigation applications to maintain vine health (2). Subsurface irrigation has been shown to be more water efficient than surface applied drip irrigation (3, 4). Unfortunately, use of buried driplines to deliver the water subsurface have been plagued with problems of soil clogging and gopher damage (5).

In 2014, research was initiated near Prosser to deliver the water directly into the root zone via hard plastic tubes placed vertically into the soil. Tubes were placed from 1 to 4 feet below the soil surface in a mature planting of Concord juice grapes. Subsurface water delivery in the Concord grapes was reduced to 30 and 60 percent of full commercial rate applied as surface drip. Two additional research sites were established in wine grape vineyards in early 2015 to deliver drip irrigation 1 to 3 deep (Figure 1). For wine grapes, irrigation volumes were reduced to 15, 30 and 60 percent of the full commercial rate being applied as surface drip throughout the 2015 growing season.

Hypothetically, applying the water directly into the lower root zone should require a lower volume of water to be applied, owing to the elimination of evaporation and non-crop water use. This technique could also influence root architecture to change by growing deeper. Likewise, root turnover could be expected to be reduced as roots become more densely concentrated in the

portion of the soil profile that is less influenced by oscillating patterns of wetting and drying. If proven, the plant could become increasingly effective in carbon allocation, reserving more carbohydrates for fruit production. Watering intervals could be lengthened and deficit irrigation could be applied more strategically to regulate plant activity toward achievement of desired production and quality goals.

Preliminary results from the 2015 growing season are promising. Concord grape clusters were heavier and contained more berries in the subsurface irrigated plots than in the surface drip irrigation plots when irrigated at either of the reduced rates of water (30 or 60 percent of ET based water replacement). In wine grapes, harvest production in subsurface irrigated plots was 70, 75, or 90 percent of that for the surface drip irrigated plots (Figure 2); however, the volume of water applied was 15, 30 or 60 percent, respectively, of that applied to the surface drip irrigated plots. Grapes tended to be smaller yet more numerous in the subsurface plots compared to the surface drip irrigated plots.

Next steps will include analytical assessment of wine grape phenolic compounds to determine what differences, if any, exist among the grapes produced under the differing levels of water stress. Both red and white wine grapes, as well as Concord grapes, are included in these trials underway on three separate site locations in the Yakima Valley.

Figure 1. Cabernet Sauvignon wine grapes grown under direct root-zone micro-irrigation in the Red Mountain AVA near Benton City, WA.

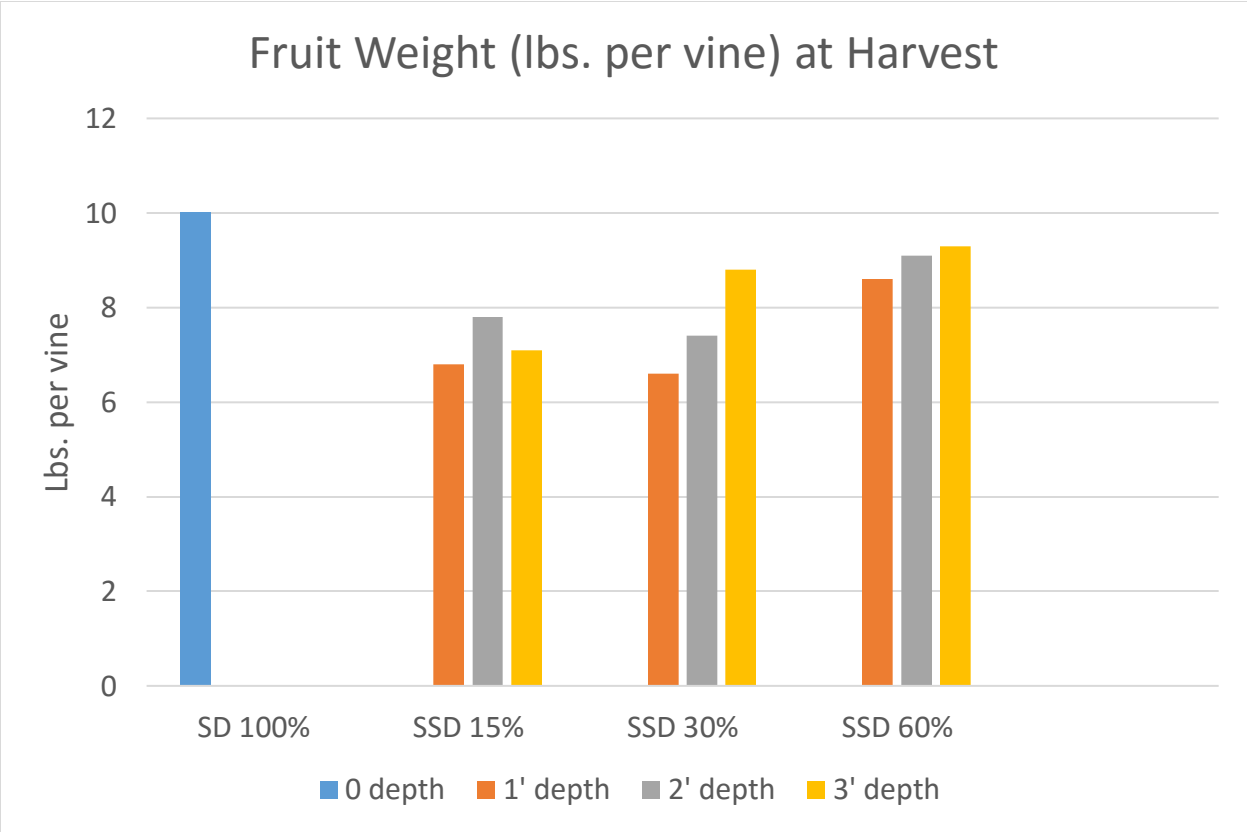

Figure 2. Pounds of wine grapes per vine harvested in 2015 under full commercial irrigation rate (blue) via surface drip irrigation (SD) compared to vines irrigated via direct root-zone subsurface delivery (SSD) at 3 depths in each of 15, 30, and 60 % of the full commercial rate of irrigation.

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