

VINEYARD MANAGEMENT IN A DROUGHT YEAR

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Water is a precious resource that is in short supply to San Joaquin Valley growers due to several consecutive years of below-average rainfall, low snow-melt runoff and a court-ordered restriction on water transfers to help save the Delta smelt. It is unclear what lies ahead for most Kern County grape growers regarding drought conditions, but some growers will have to make tough decisions about water use and crop production. Water management will be a key factor in efficiently using the limited supplies available. The following are some concepts to consider when tailoring irrigation programs to the current situation.

Grapevine water use varies throughout the growing season and is highly dependent upon canopy development and evaporative demand. Maximum vine water use is dependent on the final size of the canopy which is a function of the trellis and vine vigor; therefore, large vines grown on gable or overhead systems will have a higher requirement than vines with small canopies using a 1 or 2-wire system or small cross-arm.

Canopy development and the timing of fruit growth (for table grape vineyards) must be taken into account in developing a deficit irrigation strategy for vineyards. Water use by grapevines begins with bud break in early April and gradually increases as the canopy develops and evaporative demand increases. Vines require approximately 2.0 – 3.0 acre-inches of water from bud break to bloom in order to support canopy development. A full canopy should be developed before imposing a moderate water stress. This is particularly important for varieties that are susceptible to sunburn such as Redglobe and Thompson Seedless.

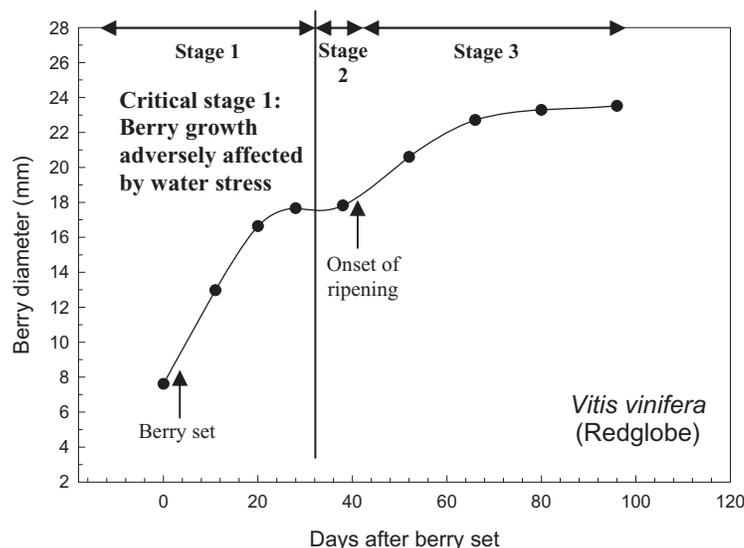


Fig. 1. The developmental pattern of fruit diameter (*V. vinifera* L. cv. Redglobe). Stage 1, 2 and 3 refer to the three stages of berry growth: 1, the initial phase of rapid growth; 2, the lag phase of slow or no growth; and 3, the final phase of resumed growth and ripening.

long as 2.5-3 months. Thompson Seedless, when harvested in early September, uses about 8.0 to 11.0 inches (depending on crop level and trellis system) during the 8 weeks it is in this phase. Regardless of variety, berry growth during this time is due primarily to cell expansion. It has been demonstrated that irrigations may be cut back (approximately 75% of full crop evapotranspiration (ET_c)) to pose a moderate stress subsequent to veraison with minimal or no effects on berry size or sugar accumulation. Therefore, if water supply is short and deficit irrigation is necessary during the ripening period, final yield and fruit quality will be less affected than if vines are stressed during

The degree to which berry growth is affected by water deficits is dependent upon the time when water stress is imposed. From bloom (early May) to veraison (late June-early July), grapevines use about 7.0 (small canopy) - 12.0 (large canopy, gable system) acre-inches of water. Proper water management is critical from bloom to approximately four weeks later, as berry growth is most susceptible to water stress during this period because cell division and expansion are occurring in young berries (Fig. 1). Therefore, if cell division is reduced by water stress at this time, final berry size and yield at harvest is reduced. Extra water applied later will not overcome a stress imposed during this critical period of berry growth.

The ripening phase covers the period from veraison to harvest and water use during this time varies greatly by variety and harvest date. For example, this period for Flame Seedless grown in early districts may only last 2-2.5 weeks ending with harvest the first week of July, while the period for Crimson Seedless in late districts may be as

the period of bloom to 4 weeks later. Furthermore, mild water stress during this period may be beneficial to promote color development and reduce berry cracking and bunch rot.

Water use during the post-harvest period, which concludes with dormancy (about mid-November), again varies with trellis type, variety and harvest date. Typical water use during this period for Thompson Seedless (harvested in early-September) ranges from 4.0 to 7.0 acre-inches of water. Water use during the post-harvest period is higher for varieties harvested earlier and lower for late-season varieties. In any case, irrigations at this time should be applied in amounts to maintain canopy but not encourage growth. Moderate water stress may be beneficial by stopping shoot growth and promoting wood maturity; however vines should not be allowed to defoliate. It is also worth noting the importance of a heavy irrigation during the dormant period in order to replenish the soil-water reservoir. Failing to irrigate post-harvest, whether by necessity or practice generally leads to poor bud break in the spring.

In conclusion, the total season's water requirement of a mature vineyard can vary greatly from 22.0 – 45+ inches depending on the variety, canopy size and trellis type and it is apparent from the discussion above that **the only time one does not want to impose a water stress is the period from bloom to four weeks later**. Furthermore, studies conducted on Thompson Seedless in the San Joaquin Valley have shown that there is a linear increase in berry weight as the amount of applied water increased from 0 to 80% of full ET when irrigating at that level all season long. It was also found that no additional increase in size is achieved when water was applied in amounts greater than 80% of full ET_c. Therefore, maximum berry size in Thompson Seedless can be obtained under mild water deficits.

A detailed Excel table featuring water use information for wine grapes, Flame Seedless and Thompson Seedless and Crimson Seedless on a gable trellis system grown in the southern San Joaquin Valley can be found online at <http://cekern.ucdavis.edu/Irrigation%5FManagement>.

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