Viticulture and Enology Program
WASHINGTON STATE UNIVERSITY

Grapevine Crop Coefficient (Kc)

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What are Crop Coefficients?

Crop coefficients (Kc) are used to adjust evapotranspiration calculations to more accurately reflect crop water use/loss. The amount of water a specific crop uses is ETc, or crop evapotranspiration. Crop water use is often described relative to the water use of grass (**ETo**). In cases where a crop uses more water than grass, **Kc** is greater than 1. In cases where the crop is more water efficient than grass, **Kc** is less than 1. The **Kc of *Vitis vinifera*** is typically less than 0.8.

Crop Water Use Calculation: ETc = Kc x ETo

In some systems, a single **Kc** is used throughout the growing season. However, the amount of water a grapevine needs changes as the canopy and fruit develop.

Because of this, Washington State University has developed a **varying-rate Kc** that is dependent on growing degree day accumulation, which serves as an estimator of canopy and fruit development. Thus, a fully-irrigated *Vitis vinifera* 'Cabernet Sauvignon' vine in eastern Washington will have a **Kc** that varies between 0.3 and 0.8 throughout the growing season when irrigation is typically used (**Figure 1**). The seasonal **Kc** values for wine grapes (based on GDD) are in Table 1.

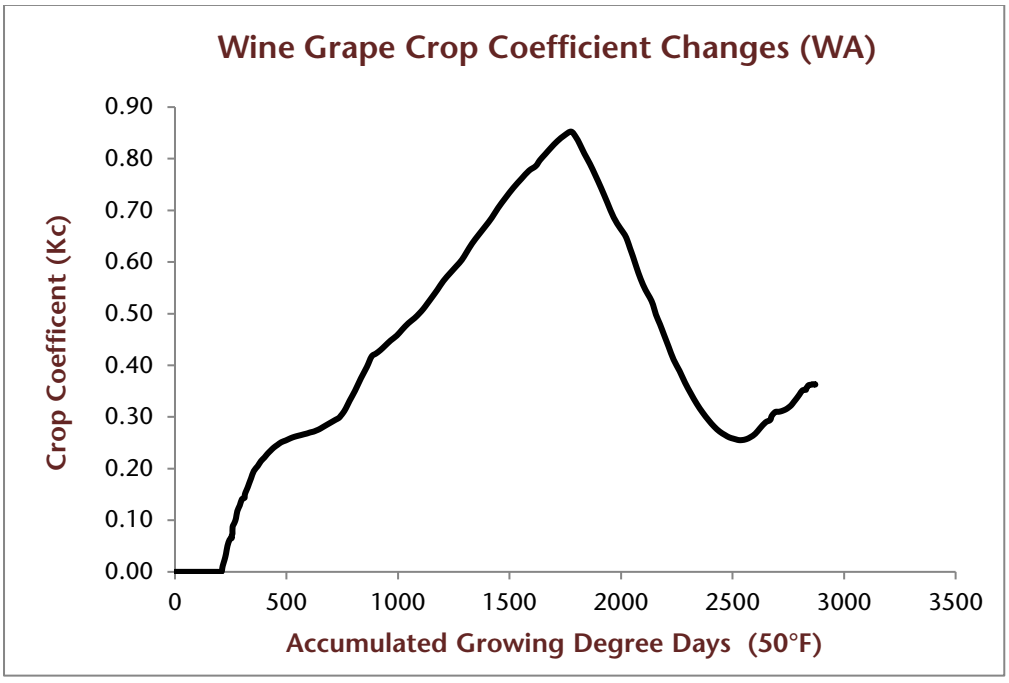

Figure 1 – The crop coefficient for a fully-irrigated *Vitis vinifera* 'Cabernet Sauvignon' vine changes through the growing season, as canopy and fruit development alter their water requirements

Reference: Evans, R.G., S.E. Spayd, R.L. Wample, M.W. Kroeger, and M.O. Mahan. 1993. Water use of Vitis vinifera grapes in Washington. Agricultural Water Management. 23(2):109-124.

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Grapevine Crop Coefficient (Kc)

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Table 1: Varying Kc for grapevines as it related to accumulated GDD (50°F) during the growing season. To figure out Kc of your grapevines, find the current GDD value in the table below; the Kc value is to the right.

GDD	Kc	GDD	Kc	GDD	Kc	GDD	Kc	GDD	Kc
0	0.00	640	0.27	1280	0.60	1920	0.73	2560	0.26
20	0.00	660	0.28	1300	0.62	1940	0.72	2580	0.26
40	0.00	680	0.29	1320	0.62	1960	0.69	2600	0.27
60	0.00	700	0.29	1340	0.64	1980	0.68	2620	0.28
80	0.00	720	0.29	1360	0.65	2000	0.66	2640	0.29
100	0.00	740	0.30	1380	0.66	2020	0.65	2660	0.29
120	0.00	760	0.32	1400	0.68	2040	0.63	2680	0.31
140	0.00	780	0.33	1420	0.69	2060	0.60	2700	0.31
160	0.00	800	0.35	1440	0.70	2080	0.58	2720	0.31
180	0.00	820	0.36	1460	0.71	2100	0.56	2740	0.32
200	0.00	840	0.38	1480	0.72	2120	0.53	2760	0.32
220	0.02	860	0.40	1500	0.73	2140	0.52	2780	0.34
240	0.05	880	0.42	1520	0.74	2160	0.50	2800	0.34
260	0.09	900	0.42	1540	0.75	2180	0.47	2820	0.35
280	0.12	920	0.43	1560	0.77	2200	0.45	2840	0.36
300	0.14	940	0.44	1580	0.78	2220	0.42	2860	0.36
320	0.16	960	0.45	1600	0.79	2240	0.41	2880	0.36
340	0.18	980	0.45	1620	0.79	2260	0.39		
360	0.20	1000	0.46	1640	0.80	2280	0.37		
380	0.21	1020	0.47	1660	0.81	2300	0.35		
400	0.22	1040	0.48	1680	0.82	2320	0.33		
420	0.23	1060	0.49	1700	0.83	2340	0.33		
440	0.24	1080	0.49	1720	0.83	2360	0.31		
460	0.25	1100	0.50	1740	0.85	2380	0.30		
480	0.25	1120	0.51	1760	0.85	2400	0.29		
500	0.25	1140	0.52	1780	0.85	2420	0.28		
520	0.26	1160	0.54	1800	0.84	2440	0.27		
540	0.26	1180	0.55	1820	0.83	2460	0.27		
560	0.26	1200	0.56	1840	0.81	2480	0.26		
580	0.27	1220	0.58	1860	0.79	2500	0.26		
600	0.27	1240	0.59	1880	0.77	2520	0.26		
620	0.27	1260	0.59	1900	0.75	2540	0.26		

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