Oregon State University

Western Oregon

Table Beet Irrigation Guide

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Total Seasonal Evapotranspiration [in]	14.3 (mean)
Peak Evapotranspiration Rate [in/day]	0.21
Maximum Allowable Depletion [percent]	50
Critical Moisture Deficit Period	Seed germination, and root expansion

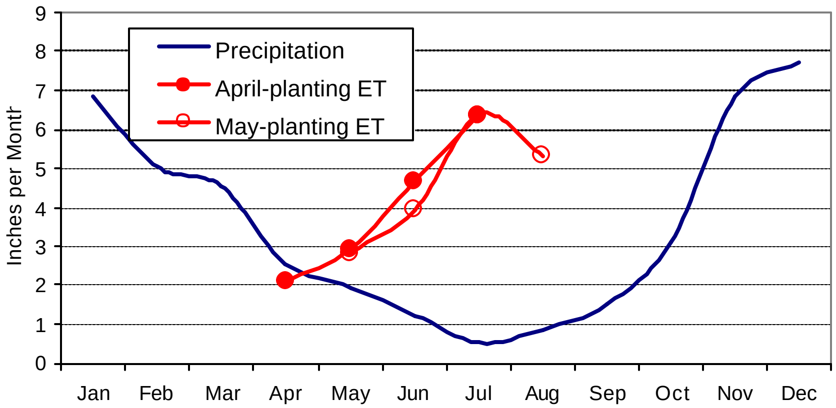

Figure 1: Typical precipitation and table beet evapotranspiration (ET) in the Willamette Valley. Tabulated values of ET are provided on the back of this sheet.

Moisture management in beets is especially important during stand establishment, the early growth stage, and root expansion. Since small beet seeds are unable to emerge when surface crusting occurs, irrigation during the pre-emergence period revolves around maintaining a loose soil surface. This often requires frequent, light irrigation. Conversely, deep excessive irrigation, which results in anaerobic soil conditions, can cause damping off of emerging seedlings during emergence and temporary cessation of growth in young plants. In the remainder of the season, available soil moisture should not be depleted by more than 50 percent.[1] As beet roots develop most of their size in the last half of their growth period, irrigation is especially critical during this time. Water deficit during this period will have the greatest negative impact on yields. A balance must be struck however, between maintaining adequate moisture while minimizing wetness in the canopy that promotes the common fungal diseases, alternaria, cercospora, and ramularia. During the last half of the growing period, irrigate only early in the day to allow for rapid canopy drying whenever possible.

The peak water use for table beets is approximately 0.21 inches per day, which occurs in July (Figure 1). On most soils, weekly irrigation during the peak is adequate, however with sandy and sandy loam soils, irrigation may be required as frequently as every three to four days.

On the back side of this page is a worksheet to aid in calculating irrigation schedules for beets. These calculations are most straightforward for those using side-roll, hand-move, or solid set sprinkler irrigation. For those with linear move or center pivot systems, all information applies except for the set time, which must be gauged to the tower travel speed. For basic schedule information, sprinkler nozzle diameters, operating pressures, and spacing and soil type must be known. To more accurately describe individual systems, the uniformity coefficient of the system and available water capacity of your soil is also needed. This worksheet was designed to be progressed through sequentially starting with item *a*). Equations listed under item headings use item letters for reference. Although the rooting depth is already supplied in the worksheet, if you have reason to believe your site is an exception (e.g. shallow restrictive layer), this may be altered. Evapotranspiration rate estimates for both April and May plantings are listed in the worksheet. Use estimates from the closest planting date.

References

1. Sanders, D.C. 1993. Vegetable Crop Irrigation, Leaflet No: 33-E (North Carolina State University, Raleigh).

Note: For additional background information and references, see "Western Oregon Irrigation Guides: Background and References."

Irrigation Schedule Worksheet: Table Beet

Use values for your specific soil and depth range from the Appendix, if available.

Otherwise use Table 1 below.

Table 1

Soil Texture	AWC [in/in]
Sandy	0.07 to 0.10
Sandy Loam	0.09 to 0.15
Loam	0.14 to 0.19
Clay Loam	0.17 to 0.22
Clay	0.20 to 0.25

A. Determine Irrigation Interval

Available Water Capacity [in/in]	***a.***	
Maximum Allowable Depletion [percent]	***b.***	50
Effective Rooting Depth [in]	***c.***	18
Peak ET [in/day]	***d.***	0.21
Maximum Irrigation Interval [days]	***e.***	
e = (a * b * c) / (d * 100)		
Your Irrigation Interval [days]	***f.***	

Note: f should be equal to or shorter than e.

Table 2

Irrigation System	Uniformity Coefficient (*)	
Solid set	70	63
Hand move or Side-roll	82	74
Pivot or Linear Move	90	81
Offset Managed Handm.	90	81

B. Determine Combined Efficiency

Uniformity Coefficient	***g.***	
Combined Efficiency	***h.***	
h = (0.01583 * g) - 0.6327		

C. Determine Depth of Irrigation

		Planting	April	May	June	July	August
Monthly Evapotranspiration Rate [in/day]	***i.***	*Apr.15*	0.07	0.09	0.16	0.21	
		May 15		0.09	0.13	0.21	0.17
Depth of Irrigation per Set [in]	***j.***						
j = (i * f) / h.							

D. Determine Set Time

Application Rate [in/hr]	***k.***	

Measure or see Tables 3 and 4 below to determine your application rate.

		April	May	June	July	August
Irrigation Set Time [hrs]	***l.***					
l = j / k						

Table 3

Pressure [psi]	Discharge [gpm] Standard Tapered Nozzle Diameter [in] 3/32	1/8	9/64	5/32	11/64	3/16	13/64	7/32
35	1.5	2.7	3.40	4.16	5.02	5.97	7.08	8.26
40	1.6	2.9	3.63	4.45	5.37	6.41	7.60	8.87
45	1.7	3.2	3.84	4.72	5.70	6.81	8.07	9.41
50	1.8	3.1	4.04	4.98	6.01	7.18	8.49	9.88
55	1.9	3.3	4.22	5.22	6.30	7.51	8.87	10.30

Table 4

Sprinkler Spacing [ft]	-by- [ft]	Application Rate [in/hr] Discharge per Nozzle [gpm] 2	3	4	5	6	8	10
20	20	0.48	0.72	0.96	1.20	1.44	1.93	2.41
20	40	0.24	0.36	0.48	0.60	0.72	0.96	1.20
30	30	0.21	0.32	0.43	0.54	0.64	0.86	1.07
30	40	0.16	0.24	0.32	0.40	0.48	0.64	0.80
30	50	0.13	0.19	0.26	0.32	0.39	0.51	0.64
40	40	0.12	0.18	0.24	0.30	0.36	0.48	0.60
40	50	0.10	0.14	0.19	0.24	0.29	0.39	0.48
40	60	0.08	0.12	0.16	0.20	0.24	0.32	0.40

(*) If your sprinkler spacing/discharge combination falls into gray-shaded area, use uniformity coefficient from the right, also gray-shaded column. Otherwise use values from the left column.

How to use these tables: