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Water Use in Vegetables—CARROTS

Arizona Water Series No. 28

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Introduction

Data on carrot production in Arizona has not been consistent in past years. The last years for reporting were 2002/03 and 2003/04, with 2,600 and 2,000 acres planted, respectively. Crop yields averaged 335 cwt./acre for each of the growing cycles, with an estimated average value close to $14,000 per acre. Unlike most vegetable crops, carrots can be harvested at different times in the growing cycle, depending on the size required. Many growers harvest carrots early in order to keep size to a minimum and receive a premium price. Other growers contract for yield, allowing the carrots to grow to full size. Water stress causes carrots to become woody and hard; too much water causes poor color and rot.

Commercial Irrigation Management

Carrots are usually irrigated using furrow irrigation. However, it is quite common for growers to use sprinklers for germination. The use of sprinklers helps to reduce the amount of water needed which reduces the potential for salts to enter the seed row and cause emergence problems. Carrots are sensitive to salt; therefore, water with an ECe of 1.0 or less should be used for irrigation.

Water stress should be avoided throughout the carrot growing cycle. The critical period for irrigation is between fruit set and harvest. An irrigation threshold of 40% soil water deficit should be targeted to avoid water stress. If using tensiometers or resistance blocks, -40 to -60 centibars should be used to trigger irrigation. Set tensiometer or resistance blocks at a depth of 12 in. This will give an accurate representation of the moisture within the plant's rootzone.

Water Use by Carrots

Two graphs illustrate water use by carrots throughout the growing season. Figure 1 shows the consumptive use of carrots as a function of Heat Units After Planting (HUAP). The temperatures used to develop this curve were 34°F for a lower threshold and 77°F for an upper threshold. The heat units should be calculated using the sinusoidal approach developed by Snyder (1985). Information on daily maximum and minimum temperatures can be obtained from AZMET.

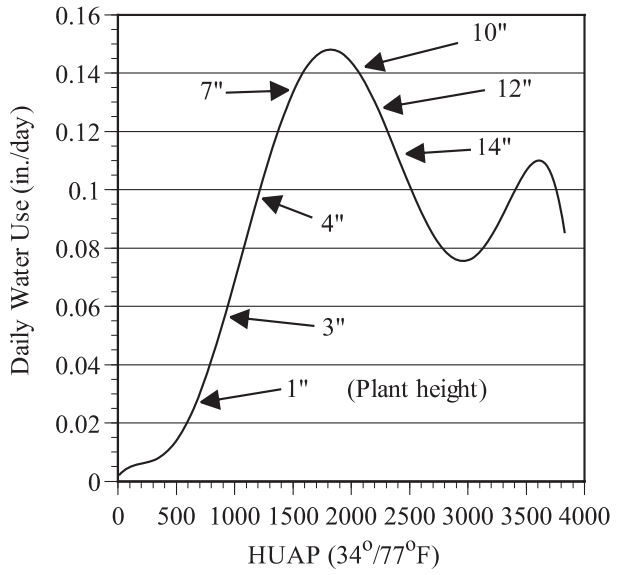

Figure 1. Average daily water use based on Heat Unit After Planting (HUAP) for carrots for a September 15th planting date.

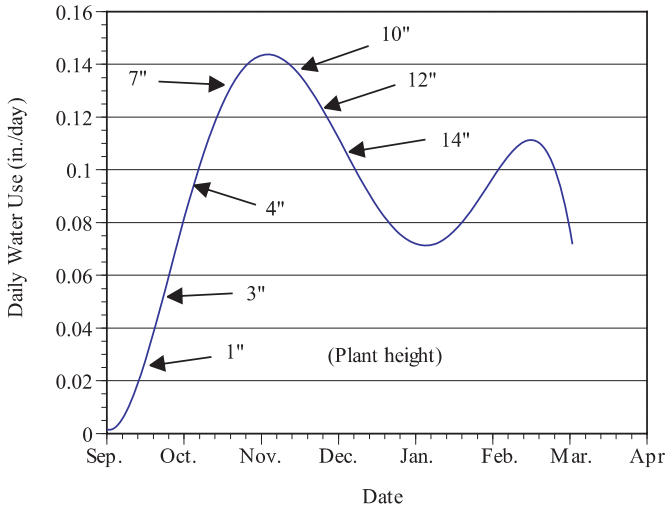

Figure 2. Average daily water use for carrots utilizing a calendar schedule for a September 15th planting date.

The total heat units required for carrots is about 2000. Grown during the winter months, this translates to approximately three to four months, depending on the time and location of planting. Peak water use occurs at 2000 HUAP with total water use for the season at about 17 inches. Data for this paper was collected over two seasons using a weighing lysimeter system as described by Martin et al. (2001).

When determining irrigation water needs, do not forget to incorporate the irrigation system's efficiency. For example, if an irrigation system has an efficiency of 75% and the crop requirement is 2 in., you should apply 2.7 in. to make up for the system's inefficiency (2 in./0.75).

The second graph (figure 2) shows average daily water use. Maximum water use by carrots is approximately 0.15 in. of water per day. This occurs when the carrots reach marketable size. However, carrots can be harvested anytime, so peak water use will vary. After the carrots reach peak size, water use begins to decline and then rises slightly before they go to seed. The rootzone calculation used for water management in carrots is 1.5 ft, although carrot roots may grow to a greater depth.

Reference

AZMET, Arizona Meteorological Network on the web at http://ag.arizona.edu/azmet/

Martin, E.C., A.S. de Oliveira, A.D. Folta, E.J. Pegelow and D.C. Slack. 2001. Development and testing of a small weighing lysimeter system to assess water use in shallow rooted crops. Transactions of the ASAE. 44(1):71-78.

Snyder, R.L. 1985. Hand calculating degree days. Agric. Forest Meteorol., 35: 353-358.

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