Scientists complete two-year study on short-day onions

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Texas AgriLife Research scientists have recently completed a two-year study on the impact of deficit irrigation and plant density on the growth, yield and quality of short-day onions.

Deficit irrigation is a strategy in which water is applied to a crop during its drought-senstitive stages of development and is either applied sparingly or not at all during other growth stages, particularly if there is sufficient rainfall, reducing the overall amount of irrigation through the crop cycle.

According to crop production experts, the strategy is particularly helpful in areas where water limitations or restrictions are a significant factor.

The study's lead researcher was Dr. Daniel Leskovar, a professor and vegetable physiologist with AgriLife Research and interim resident director for the Texas AgriLife Research and Extension Center at Uvalde. Leskovar collaborated with other AgriLife Research experts in vegetable stress physiology, Shinsuke Agehara and Dr. Kilsun Yoo, both from the Vegetable and Fruit Improvement Center, part of the Texas A&M University System.

Information about the study was first presented at the 28th International Horticultural Congress held this August in Lisbon. The study was funded in part by U.S. Department of Agriculture Food for Health and Rio Grande Basin initiatives.

"The purpose of this two-year study was to investigate how deficit irrigation and plant density affect yield, quality and quercetin levels in the short-day onion, which is an important crop for Texas, especially in South Texas and the Winter Garden area," Leskovar said.

Quercetin is a plant-based flavonoid found in onions and other vegetables and it may have anti-inflammatory and antioxidant properties, and is being investigated for other possible health benefits, Leskovar explained.

"Our research on vegetable crops, including short-day onions, takes into account various genetic, environmental and agronomic pre-harvest harvest factors which are already known to have an impact on the yield, quality and phytochemical content of fruits and vegetables," he said.

During the 2007-2008 and 2008-2009 growing seasons, researchers used irrigation rates of 100 percent, 75 percent and 50 percent of crop evapotranspiration, or ETc. Crop evapotranspiration is the sum of evaporation from the soil surface and plant transpiration from the leaves into the atmosphere. The irrigation rate at each stage of development also took into account the plant size, leaf number and height, as well as the reflectance of the crop-soil surface, canopy resistance and soil evaporation.

During both seasons, onion seeds were planted at densities of 397,000 seeds per hectare (approximately 2.47 acres) and 484,000 seeds per hectare. The onions were drip-irrigated at the three different rates to determine impact on onion shoot growth and bulb-size distribution among small, medium, large, jumbo and colossal onions, plus impact on yield and quality components.

"Yield components included the marketable yield of the crop and onion bulb size," Leskovar said. "And quality aspects were gauged in terms of

quantities of soluble solids, pyruvic acid and quercetin."

Leskovar said results indicated that while marketable yields and the number of bulbs increased at the higher plant density, the bulb size decreased. "Results also showed that deficit irrigation at the 50 percent of ETc had a significant impact on yield, while the yield from deficit irrigation at 75 percent was not notably less than at 100 percent and produced a similar bulb size," he said.

Leskovar said the main conclusion to be drawn from this research was that it would be possible for onion producers to adjust their planting densities and water-conservation practices, most specifically to a 75 percent ETc rate, as a means to "target high-price bulb sizes without reducing flavor and quercetin content."

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