

Study turns up heat on artichokes

June 30 2017, by Paul Schattenberg



These purple artichokes contain significant antioxidant compounds and have been identified as a promising “niche” item for Texas growers and retailers. The variety shown here is similar to the one used in the study. Credit: Texas A&M AgriLife Research photo

A Texas A&M AgriLife Research-led study recently published in *Seed Science and Technology* showed how Texas producers interested in growing artichokes may be able to extend their growing season through the use of ethylene regulators.

"In Texas, heat stress during late summer or early fall is a limiting factor for the establishment and production of high-value crops such as artichokes," said Dr. Daniel Leskovar, director of the Texas A&M AgriLife Research and Extension Center in Uvalde and principal investigator for the study.

Others involved in the study, called "Ethylene regulators influence germination and [root growth](#) of globe artichoke seedlings exposed to heat stress conditions," were Togo Shinohara of Sanyu Consultants Inc., Tokyo, Japan, and Eugenia Martin, a scientist visiting the center from the Instituto de Investigaciones en Ciencias Agrarias de Rosario, Argentina.

"High [seed](#) germination and root vigor are important traits to improve post-transplant performance of artichokes under heat-stress conditions," Leskovar said. "The idea behind the study was to see if using ethylene regulators, which have been shown to improve seed germination and root growth in other vegetable crops, might provide artichoke seeds and transplants some relief from heat stress and assist with fine root growth under high temperatures."

The commercial artichoke variety Green Globe Improved, botanical name *Cynara cardunculus* L. var. *scolymus*, was used in the study, which was conducted in three parts at the Uvalde center.

The first part investigated the effects of several ethylene regulators—promoters or inhibitors—on seed germination and root growth. The second investigated the effects of ethylene on early root development, and the third investigated the effects of ethylene and temperature stress on [seed germination](#) and root growth.

"This traditional artichoke variety is quite similar to others we have already tested and made some inroads toward finding the best types

suitable both for producers and retailers interested in growing and selling them in Texas," Leskovar explained. "Green Globe Improved is green with a little tint of purple, while the variety or varieties for which we feel we can find a niche market for growers and retailers in the state are more purple than green in the bracts of the heads."

He said the purple color is associated with healthy antioxidant compounds such as those found in berries, and artichokes contain a significant amount of those compounds.

"Artichoke seed is costly and so are transplants but the returns can be very high, provided the artichoke plants are maintained throughout their production," Leskovar said. "This includes making sure the seeds germinate properly and their root system is well established for growth.

"It's important that during germination the seeds have a sufficient amount of the growth regulator ethylene, which is also naturally produced in plants and controls many of its primary seedling functions."

In the study, the effects of external applications of five concentrations of ethylene regulators were evaluated on germination and early root growth of artichokes at about 73 degrees in two incubation assays. The three ethylene precursors or promoters used were DL-methionine, or DL-MET; 1-aminocyclopropane-1-carboxylic acid, or ACC; and 2-chloroethylphosphonic acid, or ethephon, ETH. Additionally, two ethylene inhibitors—aminoethoxyvinylglycine, or AVG, and 1-methylcyclopropene, or 1-MCP – were used as controls in the study.

The study also examined the effects of ethylene regulator concentrations on seeds exposed at 73 and 86 degrees, with the higher temperature considered sufficient to induce heat stress.

The results showed seed thermodormancy was significantly improved by

the application of ethephon, ETH. At the lower "optimal" temperature, early root growth was enhanced by the ethylene precursor ACC and ETH within a prescribed range, leading to increased root hair density, root area and lateral roots. While AVG induced primary root elongation, it also decreased root hair formation.

"At the higher temperature, inhibition of early [root](#) growth was alleviated when seedlings were incubated with an intermediate concentration level of ethephon applied to the seeds," Leskovar said. "ETH is known for its ability to release the growth regulator ethylene in plants."

He said the results of the study suggest that exogenous [ethylene](#) could be useful to alleviate heat stress on artichoke seeds and seedlings, which in turn may improve early [growth](#) during stand establishment.

"The ability to reduce [heat stress](#) on [artichoke](#) plants is still a challenging task but a real benefit to Texas producers in that it may allow them to extend the growing season for high-quality artichokes that appeal to both consumers and retailers – and do so in warmer conditions than the Mediterranean climate to which the artichokes were originally adapted," Leskovar said.

Provided by Texas A&M University

Citation: Study turns up heat on artichokes (2017, June 30) retrieved 27 April 2024 from <https://phys.org/news/2017-06-artichokes.html>

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