Forced Air Cooling Field Trial Results

Zucchini

A precooling experiment was conducted to test the performance of a small scale (countertop sized) forced air cooler (FAC) in parallel with product cooled by room cooling. Freshly harvested zucchini (472 lbs) were placed in a walk-in cooler set at 48 °F. In the case of "room cooling" (RC) the product temperature is reduced as a result of simply being in the room with cool air circulating around it. The same mass of product was placed in a small forced air cooler (FAC) that included a base, frame, suction fan, plenum, and plastic tarp with one end open to direct the cold room air over the product packed inside the crates. The ambient temperature of the cooler and the pulp temperature of the produce cooled using each method was monitored over time to determine and compare the precooling rate. The product started at 65 and 70 °F and, over the course of two hours, dropped 10 °F by room cooling and 16 °F by forced air cooling.

Cooler Set point 48 °F		
Zucchini (471.8 lbs)	Room Cooled	Forced Air Cooled
Starting Temp (°F)	70	65
Temp @ 20 min (°F)	69	63
Temp @ 60min (°F)	66	56
Temp @ Test End [2 hr], (°F)	60	49
Observed Cooling Rate (°F/min)	0.09	0.15
Time to 7/8 Temp (Hours)	1.9	0.8
FAC / RC Rate Ratio ("FAC is ___ times faster")		**1.7**

A standard measure of precooling rate is the time required to bring the product down ⅞ of the way to the target storage temperature. This is called "⅞ time". Based on this test, when starting at 65 °F, it was estimated that the ⅞ time for forced air cooling was 1.6 hours (actual) and for room cooling (starting at 70 °F) it was 3.7 hours (estimated). **These results show that it takes 2.3 times longer to room cool zucchini when compared to FAC (or FAC is 1.7 times faster).**

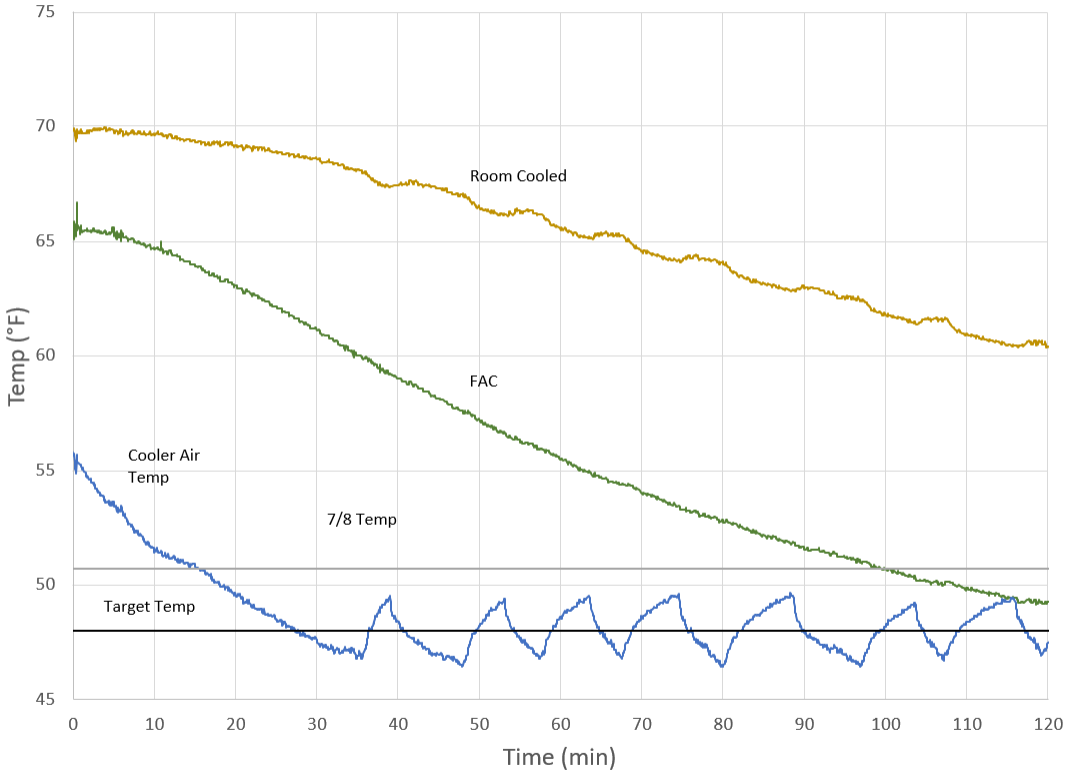

Figure - Comparison of zucchini cooled using room cooling and forced air cooling methods.

Acknowledgments

Funding for this publication was made possible, in part, by the USDA NE SARE program under grant #LNE16 -347. Thanks to Jericho Settlers Farm for participation in this trial.

Andrew S. Chamberlin and Christopher W. Callahan

V 1.0 — May 2019

NORTHEAST SARE Sustainable Agriculture Research & Education | Ag Engineering | The University of Vermont Extension

CULTIVATING HEALTHY COMMUNITIES

COLLEGE OF AGRICULTURE AND LIFE SCIENCES