

FORCED AIR COOLING FIELD TRIAL RESULTS

Eggplant



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 eggplant (24 lbs) was placed in a CoolBot

controlled walk-in cooler set at 46 °F. In the case of room cooling 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 eggplant started at 90 °F and, over the course of an hour, dropped 19 °F by room cooling and 36 °F by forced air cooling.

A standard measure of precooling rate is the time required to bring the product down $\frac{7}{8}$ of the way to the target storage temperature. This is called “ $\frac{7}{8}$ time”. Based on this test, when starting at 90 °F it was determined that the $\frac{7}{8}$ time for forced air cooling was 1.5 hours (actual) and for room cooling it was 3.2 hours (estimated). **These results show that it takes 2.1 times longer to room cool eggplant when compared to FAC (or FAC is 1.5 times faster).**

Acknowledgments

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Cooler Set point (°F) 46		
Eggplant (23.5 lbs)	Room Cooled	Forced Air Cooled
Starting Temp (°F)	90	91
Temp @ 20min (°F)	85	75
Temp @ 60min (°F)	71	55
Temp @ Test End [1hr 25min], (°F)	63	51
Observed Cooling Rate (°F/min)	0.32	0.47
Time to 7/8 Temp (Hours)	3.2	1.5
FAC / RC Ratio ("FAC is ___ times faster")		
1.5		

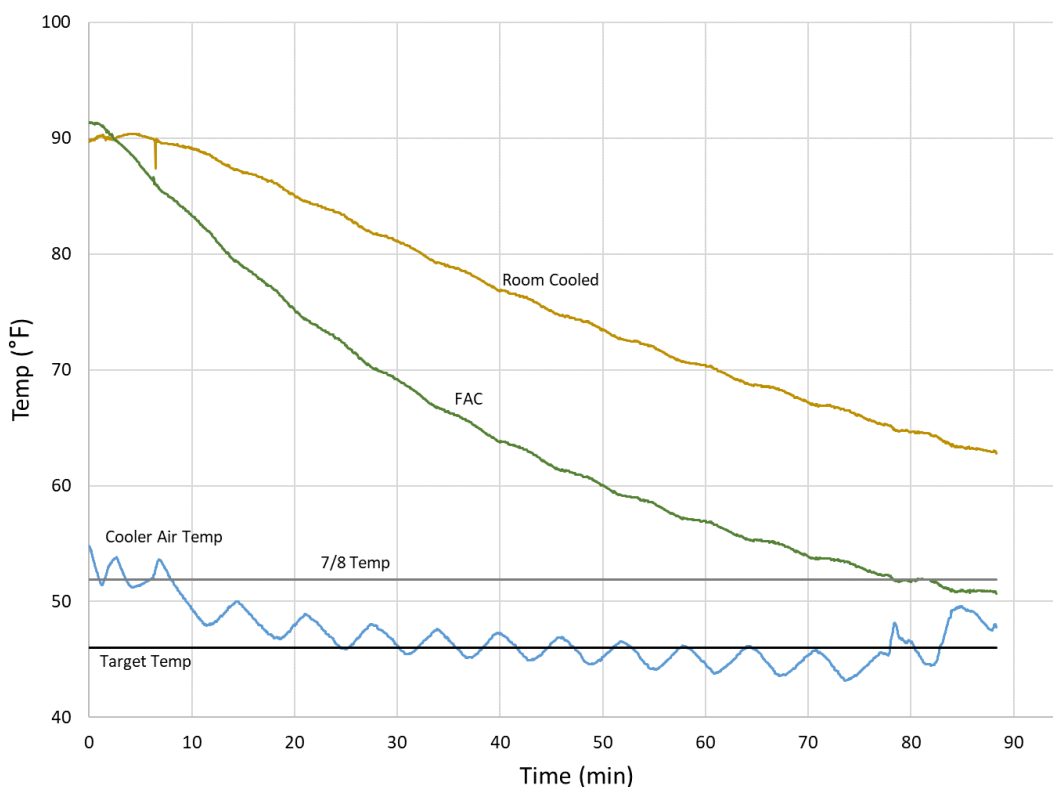


Figure - Comparison of eggplant cooled using room cooling and forced air cooling methods.

FORCED AIR COOLING FIELD TRIAL RESULTS

Watermelon



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 watermelon (123 lbs)

was placed in a CoolBot controlled walk-in cooler set at 46 °F. In the case of room cooling 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 96 °F and, over the course of an hour, dropped 3 °F by room cooling and 7 °F by forced air cooling.

A standard measure of precooling rate is the time required to bring the product down 7/8 of the way to the target storage temperature. This is called "7/8 time". Based on this test, when starting at 96 °F, it was estimated that the 7/8 time for forced air cooling was 14 hours and for room cooling it was 29 hours. These results show that it takes 2.1 times longer to room cool watermelon when compared to FAC (or FAC is 1.6 times faster).

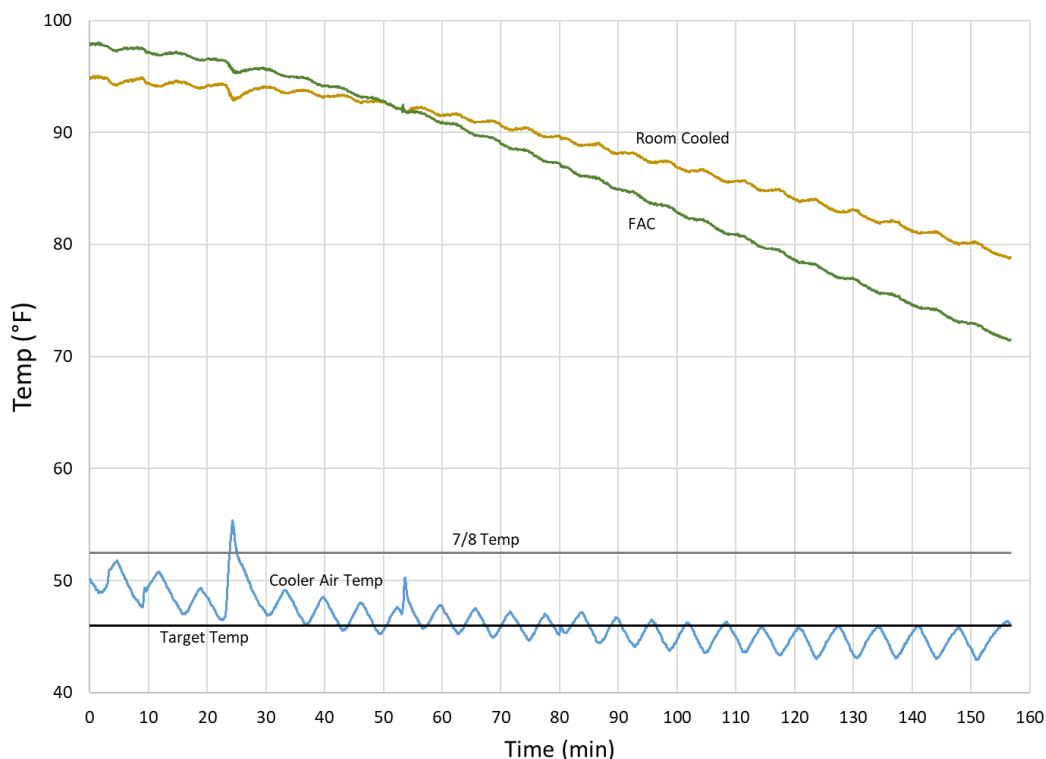
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Figure - Comparison of watermelon cooled using room cooling and forced air cooling methods.



Cooler Set point (°F) 46		
Melons (123.4lbs)	Room Cooled	Forced Air Cooled
Starting Temp (°F)	95	98
Temp @ 20min (°F)	94	97
Temp @ 60min (°F)	92	91
Temp @ Test End [2hr 35min], (°F)	79	72
Observed Cooling Rate (degF/min)	0.10	0.17
Time to 7/8 Temp (Hours), estimated	29	14
FAC / RC Ratio ("FAC is ___ times faster")		1.6



FORCED AIR COOLING FIELD TRIAL RESULTS

Strawberries



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 strawberries (19 lbs)

were placed in a walk-in cooler set at 40 °F. In the case of room cooling 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 70 °F and, over the course of an hour, dropped 11 °F by room cooling and 22 °F by forced air cooling.

A standard measure of precooling rate is the time required to bring the product down 7/8 of the way to the target storage temperature. This is called "7/8 time". Based on this test, when starting at 70 °F, it was estimated that the 7/8 time for forced air cooling was 1.5 hours (actual) and for room cooling it was 5 hours (estimated). **These results show that it takes 3.3 times longer to room cool watermelon when compared to FAC (or FAC is 1.3 times faster).**

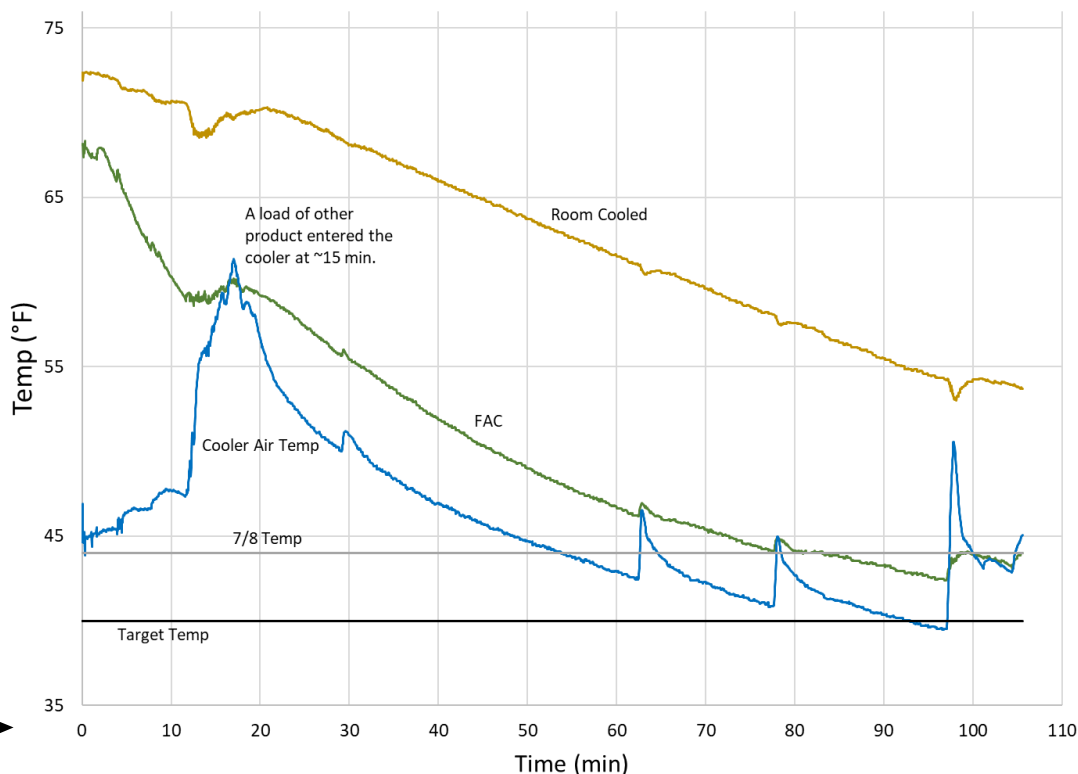
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Figure - Comparison of strawberries cooled using room cooling and forced air cooling methods.



Cooler Set point (°F) 40	Room Cooled	Forced Air Cooled
Strawberries (18.7 lbs)		
Starting Temp (°F)	72	68
Temp @ 20min (°F)	70	59
Temp @ 60min (°F)	61	46
Temp @ Test End [1hr 40min], (°F)	54	44
Observed Cooling Rate (°F/min)	0.18	0.24
Time to 7/8 Temp (Hours)	5.0	1.5
FAC / RC Rate Ratio ("FAC is ___ times faster")		1.3



FORCED AIR COOLING FIELD TRIAL RESULTS

Blueberries



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 blueberries (28 lbs) were placed in a walk-in cooler set at 40 °F. In the case of room cooling 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 83 °F and, over the course of an hour, dropped 9 °F by room cooling and 30 °F by forced air cooling.

A standard measure of precooling rate is the time required to bring the product down $\frac{7}{8}$ of the way to the target storage temperature. This is called " $\frac{7}{8}$ time". Based on this test, when starting at 83 °F, it was estimated that the $\frac{7}{8}$ time for forced air cooling was 1.8 hours (actual) and for room cooling it was 6.9 hours (estimated). **These results show that it takes 3.8 times longer to room cool watermelon when compared to FAC (or FAC is 2.2 times faster).**

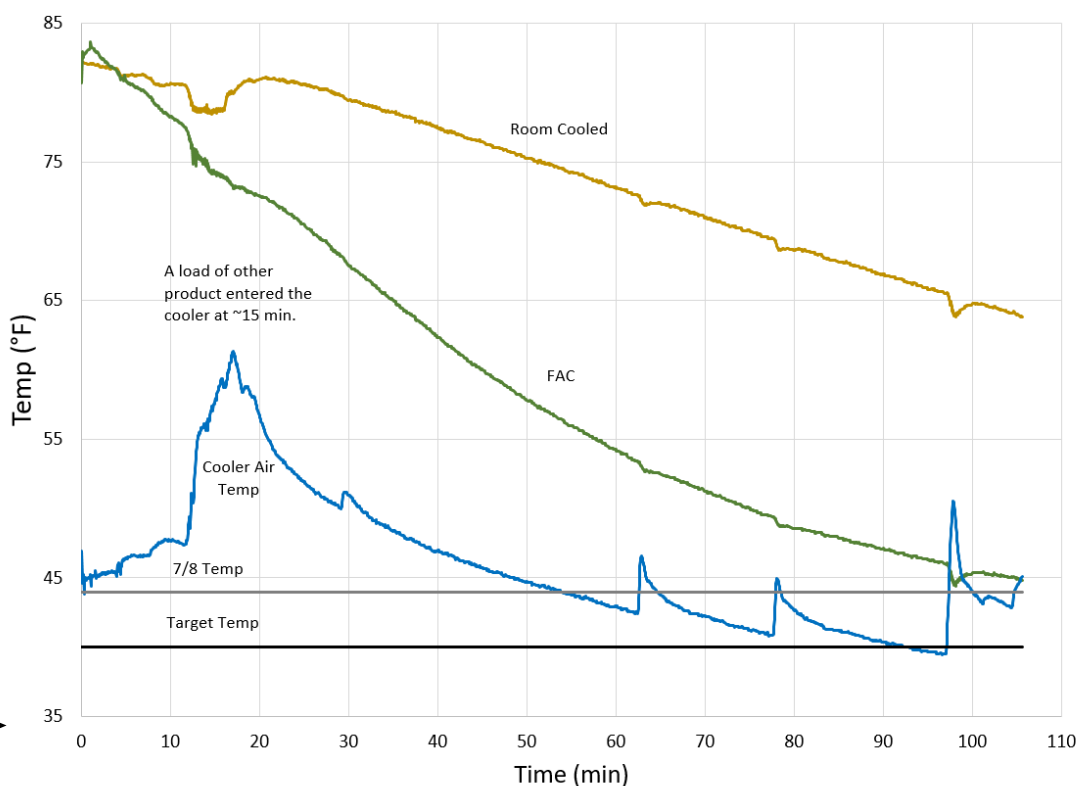
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Figure - Comparison of blueberries cooled using room cooling and forced air cooling methods.



Cooler Set point (°F) 40	Room Cooled	Forced Air Cooled
Blueberries (27.7 lbs)		
Starting Temp (°F)	82	84
Temp @ 20min (°F)	81	73
Temp @ 60min (°F)	73	54
Temp @ Test End [1hr 40min], (°F)	65	45
Observed Cooling Rate (°F/min)	0.18	0.39
Time to 7/8 Temp (Hours)	6.9	1.8
FAC / RC Rate Ratio ("FAC is ___ times faster")		2.2



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.

A standard measure of precooling rate is the time required to bring the product down $\frac{7}{8}$ of the way to the target storage temperature. This is called “ $\frac{7}{8}$ time”. Based on this test, when starting at 65 °F, it was estimated that the $\frac{7}{8}$ 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).**

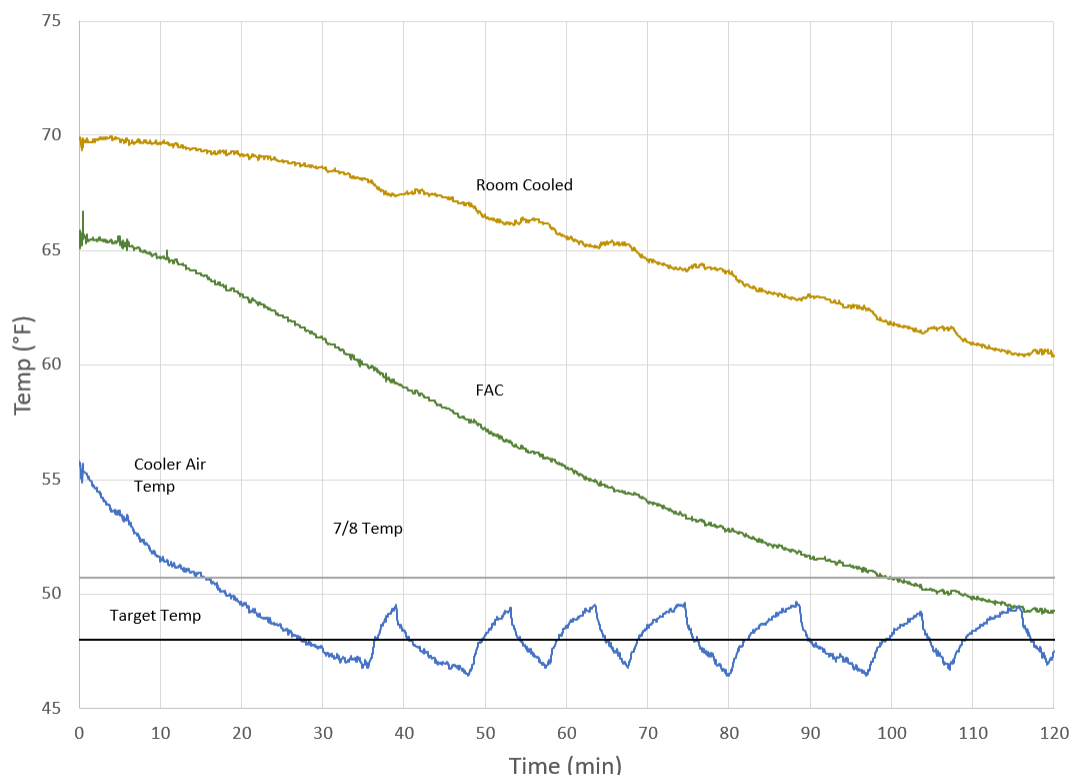
Acknowledgments

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



Cooler Set point 48 °F	Room Cooled	Forced Air Cooled
Zucchini (471.8 lbs)		
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



FORCED AIR COOLING FIELD TRIAL RESULTS

Roasting Peppers



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 roasting peppers (63 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 73 and 71 °F and, over the course of two hours, dropped 18 °F by room cooling and 27 °F by forced air cooling.

A standard measure of precooling rate is the time required to bring the product down $\frac{7}{8}$ of the way to the target storage temperature. This is called “ $\frac{7}{8}$ time”. Based on this test, when starting at 73 °F, it was observed that the $\frac{7}{8}$ time for forced air cooling was 1 hour (actual) and for room cooling it estimated to be 3.2 hours. **These results show that it takes 3.2 times longer to room cool roasting peppers when compared to FAC (or FAC is 1.2 times faster).**

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



Cooler Set point 48 °F		
Roasting Peppers (63.3 lbs)	Room Cooled	Forced Air Cooled
Starting Temp (°F)	71	73
Temp @ 20 min (°F)	66	60
Temp @ 60min (°F)	60	59
Temp @ Test End [2 hr], (°F)	53	46
Observed Cooling Rate (°F/min)	0.15	0.19
Time to 7/8 Temp (Hours)	1.6	0.5
FAC / RC Rate Ratio ("FAC is __ times faster")		1.2

