

cooling is completed. There is a large difference in the temperature between the fruit near the air inlet and the fruit in the last basket downstream. Precooler personnel should be trained to use proper strawberry temperature measurement techniques. Leaving strawberries in the forced-air cooler longer than necessary can lead to undesirable water loss because of rapid air movement. On the other hand, inadequate cooling can lead to rapid deterioration due to high temperatures.

Following cooling, strawberries should be stored in a cold room maintained at 0-1.1°C (32-34°F) for the shortest time possible. The cold room temperature should be colder than the temperature of the berries leaving the precooler. In addition to inefficient use of refrigeration, berries that have been cooled and then allowed to rewarm (causing moisture to condense on them) are extremely susceptible to decay. Humidity as well as temperature must be controlled in storage facilities. If the air inside the storage room is too dry, water will evaporate from the strawberries and they will become soft and shriveled. At a storage room temperature of 0°C (32°F), the relative humidity should be from 90 to 95 percent. Much of the water that evaporates from the fruit condenses on the inside surfaces of the room or is absorbed into packing materials. Under certain atmospheric conditions, it may be necessary to add moisture with a humidification system.

Trailers that are to carry strawberries should be precooled to 1.1°C (34°F) prior to loading. Also, extreme care must be exercised in loading palletized units to prevent shifting during transit by using strapping and corner boards. Proper bracing is a must for palletized strawberry shipments. The pallet units should be loaded away from the walls to prevent outside heat from transferring directly into the berries.

## Conclusion

This publication presents cooling requirements, cooling methods, quality parameters, and management guidelines for maintaining the quality of Florida strawberries. Studies conducted to establish the relationship between cooling rate and air flow rate and the effects of new vent hole designs on cooling rates of strawberries are discussed. Management guidelines or recommendations to the packinghouse operators concerning possible system performance improvements are presented, such as increasing resident time within the forced-air precooler to achieve better cooling or lowering the

**Table 3. Cooling time as function of fruit location. There were nine baskets along the flow path.**

Air flow rates m <sup>3</sup> /kg s (ft <sup>3</sup> /min lb)	7/8-Cooling time (minutes)			
	Basket 1	Basket 3	Basket 6	Basket 9
1.04x10 <sup>-3</sup> (1.0)	84	102	134	160
2.08x10 <sup>-3</sup> (2.0)	48	56	72	82
4.16x10 <sup>-3</sup> (4.0)	38	46	58	74
6.24x10 <sup>-3</sup> (6.0)	28	28	34	52

**Table 4. Temperature distribution at the time basket 1 reaches 7/8-cooling time for standard cartons.**

Air flow rates m <sup>3</sup> /kg s (ft <sup>3</sup> /lb min)	Temperature, °C (°F)			
	Basket 1	Basket 5	Basket 9	Mass Avg. (3 cartons)
1.04x10 <sup>-3</sup> (1.0)	4.7 (40.5)	5.6 (42.1)	10.6 (51.1)	7.3 (45.1)
2.08x10 <sup>-3</sup> (2.0)	4.7 (40.5)	6.5 (43.7)	10.2 (50.4)	6.7 (44.1)
4.16x10 <sup>-3</sup> (4.0)	4.7 (40.5)	6.7 (44.1)	11.1 (52.0)	7.1 (44.8)
6.24x10 <sup>-3</sup> (6.0)	4.4 (40.5)	5.0 (41.0)	10.7 (51.3)	5.9 (42.6)

**Table 5. Temperature of top fruit in the first basket compared to the average temperature of the last basket at 7/8-cooling time of top fruit.**

Air flow rates m <sup>3</sup> /kg s (ft <sup>3</sup> /lb min)	Temperature, °C (°F)		
	Top Fruit	Basket 1	Basket 9
1.04x10 <sup>-3</sup> (1.0)	4.6 (40.3)	9.8 (49.6)	16.3 (61.3)
2.08x10 <sup>-3</sup> (2.0)	4.6 (40.3)	8.8 (47.8)	15.1 (59.2)
4.16x10 <sup>-3</sup> (4.0)	4.7 (40.5)	9.2 (48.6)	16.2 (61.2)
6.24x10 <sup>-3</sup> (6.0)	4.2 (40.5)	7.9 (46.2)	15.1 (59.2)

cold room temperature to prevent warming of precooled strawberries. To continue delivery of a high-quality product, growers need to grow and harvest high-quality strawberries, and after-harvest product quality must be maintained with the right precooling, handling, and storage methods.

## References

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