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Project title: CA Storage of Golden Delicious Apples with Increased Humidity

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The objectives of this study are:
To demonstrate that weight loss can be reduced during CA storage by maintaining a high relative
humidity.

To determine what problems are associated with high humidity in CA storage.

Significant findings:

Year 1   1998 – 1999 Storage Season
- Need many small droplets, fog not sprinkler, with high surface area to effect humidity at CA
  conditions.
- RH control based on fog on time was not conclusive. Need to control based on RH
  measurement.

Year 2   1999 – 2000 Storage Season
- Did not have good agreement between four different RH sensors indicating the need for
  good RH sensors.
- The controller used sensed a lower RH then actually existed in the room and added excessive
  fog to the storage room.
- Can prevent weight loss with excessive fogging, but at the cost of increased Decay. Also
  some of the apples split from absorbing too much water. Need to find the right balance
  between reduced weight loss and increased fruit spoilage from added humidity.

Year 3   2000 – 2001 Storage Season
- The RH controllers used last season were fixed so that they sensed the room RH better and
  did not add excessive water to the storage room.
- Our Test rooms are of a modern design so that weight loss during storage is only 2%.
  Benefits of additional humidity are offset by increased fruit spoilage.
- RH control could help older CA rooms that normally have 5 to 10% weight loss.

Methods:

Sixteen bins of Golden Delicious apples were obtained from four different growers and split evenly
into RCA rooms 106 and 108. Room 106 was used as a control with no extra humidity added. A
Penguin controller supplied by Optiguide, (www.optiguide.co.il), was used to maintain elevated
relative humidity. Samples were uniformly taken from each grower in each room and set aside in
each room for QC analysis every two months. Another 2 sets of 40 apples were marked and
weighted, then placed in each room. They were removed, weighted and replaced into the rooms to
monitor weight loss over time.

Results and discussion:

Last years problem with the Penguin controller from Optiguide turned out to be one of installation. The controller was placed inside a plastic case for protection. The case had holes for airflow through the box and a fan that drew air into the case past the sensor and then out of the box. During last years storage season something happened in the case. Either the fan stopped or it was not able to force sufficient air through the case to ensure that the air measured by the sensor was representative of the room air. It could be that the heat given off by the fan raised the temperature of the air in the case causing the RH in the case to always be lower than the room RH. A 1°F change in temperature causes a 4% change in relative humidity.

This season Optiguide supplied new stronger fans that force much more air through the box providing a more representative measurement of the room RH. The controller worked very well during this storage season.

The theory behind adding fog to CA rooms is to provide an alternative source of water to condense on the cooling coils instead of water from the fruit stored in the room. The best solution is to design a cooling system that minimizes the amount of moisture that condenses on the cooling coils. The results from this study indicate that a 2% weight loss is a very good compromise between fruit weight loss and cooling equipment cost.

However, not everyone has new CA rooms with larger cooling coils. There should be significant benefit to install a fog based RH control system to older CA rooms that normally have 5 to 10% weight loss during storage.