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X The Shelf Life of Northwestern Delicious Apples in
Retail Store Display Cases X

By

William E. Lewis, Senior Horticulturist

Division of Handling, Transportation and
Storage of Horticultural Crops

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The Shelf Life of Northwestern Delicious Apples in Retail Store Display Cases

Introduction

Experimental evidence and practical experience have shown that apples will retain their best quality and condition when stored for several months if the temperature is 30° to 32° F. Retail store operators who are not concerned with long storage commonly display apples in unrefrigerated cases even when refrigerated equipment is available. The principal purpose of this study was to determine the quality and condition of Northern Delicious apples after several day display on refrigerated and non-refrigerated cases in a room maintained at normal retail store temperature. The effect of sprinkling several times daily with tap water was also studied. The tests were conducted in a display room on the ground floor of a well insulated brick building located at Beltsville, Md.

Operation of the Display Room

A 6-foot display case with galvanized metal bottom and sides was used for non-refrigerated displays. It was provided with a slatted rack sloping towards the front. The distance from the front to the back of the case was 30 inches and the back was 32 inches high. The top extended 13 inches from the back toward the front.

Two 10-foot commercial, mechanically refrigerated cases with mirror backs were used, one of which was a forced-air-circulation type and the other a convection or gravity-flow type.

In each of the 3 cases one lot was lightly sprinkled with tap water several times daily and a duplicate lot was not sprinkled at any time.

The apples were tested during February, March, and December, 1952, and January, February, and April, 1953. They were obtained in original containers from the Washington, D. C. wholesale produce market. The size of the apples used during different test periods were 72's, 80's, 88's, and 100's.

Decayed apples and those with discolored bruises were discarded and the remainder were sorted into representative samples and arranged on each rack 2 and 3 layers deep, extending from the front to the back of each case. An average of 35 apples were used in each sample.

The apples were held in the non-refrigerated and mechanically refrigerated cases continuously for 4 days except for the time necessary each day to weigh and examine the individual fruits for changes that may have developed during the previous 24-hour period.

The average daytime display room air temperatures ranged from 72° during one test to 77° during another, averaging 75° F. for 6 test periods.

Fruit temperatures were obtained with thermocouples which were inserted about 1/2 inch deep in apples in the top and bottom layers at the front and back of each case.

Ripeness and flavor were judged by a taste panel consisting of 8 to 10 members of the staff.

Results

The average fruit temperatures in the non-refrigerated displays ranged from 68° in one test to 76° in another, averaging 72° F., and in the mechanically refrigerated cases they ranged from 42° to 48°, averaging 45°. There was a difference of 27 degrees between the apples that were refrigerated and those held at room temperatures.

The principal factors of quality studied in these tests were decay, internal breakdown, discoloration of bruises, ripening, flavor, weight changes, and firmness.

At the end of the 4-day tests all quality and condition factors were in favor of the refrigerated apples but only to a slight extent (table 1). The refrigerated apples, however, remained bright and had a desirable "ring" when rubbed, whereas the non-refrigerated apples had a dull appearance, an oily feel, and no "ring". No decay developed in the refrigerated apples and an average of less than 1 percent was present in the non-refrigerated lots.

There were no significant differences in ripeness and flavor between the refrigerated apples and those held at room temperatures during the tests; the refrigerated apples scored only 4/10 of a point higher for ripeness and 2/10 higher for flavor. Pressure resistance was 6/10 of a pound higher in the refrigerated apples.

Differences between the sprinkled and the non-sprinkled apples were of little importance (table 2). Pressure tests and the ratings for flavor were identical; and the sprinkled apples scored only 7/10 of a point higher for ripeness by a taste panel. Practically no temperature differences were found between the sprinkled and the non-sprinkled apples.

The results of one test with Northwestern Delicious apples were not included in the tables because of the badly bruised and full ripe condition of the fruit when received from the wholesaler. The apples were of 72 size and were tested April 14, 1953. When placed in the display cases the pressure test of the apples was 10.7 pounds. Apples that were decayed, showed evidence of internal breakdown, or had discolored bruises were discarded at the beginning of the test. At the end of 4 days, bruises that were present at the start of the test had become badly discolored on 30 percent of the non-refrigerated apples; and 3 percent had developed internal breakdown. No discolored bruises or internal breakdown were found in the refrigerated apples. The non-refrigerated apples lost 2-1/2 percent in weight while the refrigerated lost 1/2 percent. Pressure tests averaged 9.4 pounds for the non-refrigerated and 9.8 pounds for the refrigerated apples at the end of the test period. No decay was found in any of the lots.

Summary

Northwestern Delicious apples were displayed continuously in non-refrigerated and mechanically refrigerated cases for 4 days.

The sizes of apples used were 72's, 80's, 88's, and 100's.

The average temperatures of the refrigerated and the non-refrigerated apples were 45° and 72° F., respectively, a difference of 27 degrees.

After 4 days the refrigerated apples had a more attractive appearance and "live" feel than the apples held at room temperatures. In other respects there were only slight differences due to temperature.

One lot of fully ripe, badly bruised apples deteriorated much faster when displayed with no refrigeration than those that were refrigerated.

Differences in the quality and condition of apples that had been sprinkled several times daily and those that were not sprinkled were insignificant.

Suggestions for Prolonging the Shelf Life of Northwestern Delicious Apples

Delicious apples will retain a bright attractive appearance longer if refrigerated than if held at room temperatures.

When space in refrigerated cases is limited, apples of good quality and condition may be displayed satisfactorily for several days in non-refrigerated cases. Apples in an advanced stage of ripeness, however, will deteriorate rapidly and become worthless if not refrigerated or moved quickly into consumption.

Sprinkling with tap water several times daily had no material effect upon the quality and condition of the apples.

Table 1. Effect of Refrigeration on the Condition of Northwestern Delicious Apples. (Averages of 6 tests).

	In non- refrigerated case	In mechanically refrigerated case	Difference
Fruit temperatures	72° F.	45° F.	27 degrees
Weight loss (percent)	0.9	0.5	0.4
Decay (percent)	0.7	0.0	0.7
Internal breakdown (percent)	1.3	0.0	1.3
Discolored bruises (percent)	0.9	0.0	0.9
Pressure tests (lbs.)	11.1	11.7	0.6
Ripeness (score) 1/	4.8	5.2	0.4
Flavor (score) 1/	6.0	5.8	0.2

1/ Ripeness and flavor scores were based upon a scale of 1 to 10, with 1 indicative of the ripest or lowest quality and 10 the least ripe fruit or the highest quality.

Table 2. Effect of Sprinkling with Tap Water on the Condition of Northwestern Delicious Apples. (Averages of 6 tests).

	Not Sprinkled	Sprinkled	Difference
Weight loss (percent)	0.8	0.5	0.3
Decay (percent)	0.3	0.3	0.0
Internal breakdown (percent)	0.4	1.1	0.7
Discolored bruises (percent)	0.7	0.2	0.5
Pressure tests (lbs.)	11.4	11.4	0.0
Ripeness (score) 1/	4.7	5.4	0.7
Flavor (score) 1/	5.9	5.9	0.0

1/ Ripeness and flavor scores were based upon a scale of 1 to 10, with 1 indicative of the ripest or lowest quality and 10 the least ripe or the highest quality.